RESEARCH PAPER
CAA-RP-87-2

HISTORICAL CHARACTERISTICS OF COMBAT FOR WARGAMES

(BENCHMARKS)

JULY 1988

PREPARED BY
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For 260 battles between 1937 and 1982 historical data were assembled about the environment tactics, outcomes and number of weapons in each force. From this data, a series of ratios, percentages and rates were calculated for each battle describing its characteristics. For each characteristic, the range was determined within which it was usually found and the median value of the characteristic. These ranges and medians may serve as criteria of credibility for the results of wargames and combat simulations. A procedure is provided for comparing these criteria with the results.

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CAA	**HISTORICAL CHARACTERISTICS OF COMBAT FOR WARGAMES (BENCHMARKS)**	**SUMMARY CAA-RP-87-2**

THE REASON FOR PERFORMING THE STUDY is because of a need to compare wargames results with military history.

THE PRINCIPAL ACCOMPLISHMENTS of ~~the~~ work ~~reported~~ is the derivation of tables of numerical characteristics that describe ground combat during the last 50 years.

THE KEY ASSUMPTION. Incompleteness of the data does not make it unusable.

THE PRINCIPAL LIMITATION is the unavailability of data about battles in Vietnam and incompleteness of available data on battles elsewhere;

THE STUDY OBJECTIVE is to provide a tool for judging whether the results of simulated combat are consistent with historical combat.

THE BASIC APPROACH is to assemble available data on actual battles and calculate simple ratios and rates that describe each. This involved:

a. From 260 modern battles, data were gathered about 45 characteristics.

b. From these characteristics, 28 ratios and rates were calculated.

c. Medians and ranges of these values were calculated and tabulated.

d. Forms were designed to compare these values with wargame results.

THE STUDY was carried out by Robert McQuie under the CAA Research and Study Fellowship.

COMMENTS AND QUESTIONS may be sent to the Director, US Army Concepts Analysis Agency, ATTN: CSCA-MV, 8120 Woodmont Avenue, Bethesda, Maryland 20814-2797.

Tear-out copies of this synopsis are at back cover.

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CHAPTER 1

A PERPLEXING REQUIREMENT OF WARGAME RESULTS

1-1. HOW CREDIBLE ARE WARGAME RESULTS?

a. The results of wargames and combat simulations are often surprising. The casualty rates, for example, may have been negligible, or the unit with the most weapons may have been defeated. Surprising results lead to questions by the users of wargame results. The questions are serious ones and often result in a requirement to make more simulation runs or to explain in detail the results of already run battles and campaigns.

b. When the results produce an unexpected type of battle or lead to a surprising conclusion, uncertainties also arise in the minds of the producers of wargame results. The question arises: has a key discovery been made or was there an error in the data about weapons and terrain or in the programing? There is no simple way to answer that question.

1-2. HOW COULD THAT QUESTION BE ANSWERED?

a. In this paper the term "wargame" will be used to refer to two types of combat models, interactive games with players and simulations without. The solution proposed to the preceding questions is that a model should reflect what has happened on real battlefields. When the forces in an historical battle are simulated, the model should produce results similar to the actual battle. This does not seem like an unreasonable demand. While comparing simulated combat with history may not absolutely ensure model credibility, it is claimed to be a first step toward that goal.

b. How to make this comparison and where to get the historical data has been discussed widely. It has been suggested that an historical battle, perhaps the Battle of the Bulge or of Okinawa, could be replayed on a particular simulation; if the outcomes of both battles were similar, they would support the tactical realism of that combat model. With this approach, however, there is a problem. If the wargame being tested is stochastic, perhaps 20 or more replays would be needed to establish averages that are reliable in the statistical sense of each characteristic of battle. This would be an expensive and time consuming exercise. Even if such an exercise could be carried out it would not be conclusive, because replays of the real battle could not be available for comparison. What appears to be needed to establish credibility is to take the available historical data and make them useful, even if only as preliminary guides to analysis.

c. In light of the preceding, the obvious approach of comparing a game with history does not appear to be workable. Merely assembling the historical data that is available and letting it speak for itself is unlikely to produce much insight. The principal reason for this is that any battle could have turned out differently without too many changes of circumstances. Wellington's remark that Waterloo was "the closest run thing you ever saw" has applied to many other battles as well.

d. The thought underlying this paper is that the way to simplify making the data useful may be found in the field of medicine. Patients and battles share a key characteristic; both perform in surprising ways because of the influence of human nature. In medicine, diagnosis uses objective data to outline the problem, but leaves room for judgment to interpret the results.

e. An example may be seen in Figure 1, a form reporting the results of a standard medical blood test. A sample of blood has been taken, and a laboratory has used it to measure on each line of the form one of the 23 characteristics of the individual being tested. Readings on these measures are noted in the "Results" column, and the acceptable ranges for the readings are noted in the "Expected Range" column. The acceptable ranges are set from data about actual patients tested by the laboratory in question. A physician compares the two columns and then decides in what areas there may be problems for further investigation. In the example, although several readings are outside the expected ranges, in his judgment, only two, chlorides and triglycerides, are sufficiently extreme to warrant his attention. He has marked these two with a check mark. The tests guide him in reaching a conclusion; they do not calculate the conclusion for him.

f. A similar approach will be pursued in devising a method of diagnosing the symptoms of wargames. A set of standard characteristics or criteria will be derived from historical battles. These criteria of tactical plausibility may be referred to as "benchmarks."

1-3. SUMMARY. In summary, then, the need for a method of assessing the credibility of wargame results has been recognized for a long time. Doing this appears possible using an approach analogous to the use of medical tests to diagnose patients by a physician. For wargames, it involves establishing standard characteristics from historical combat, comparing them with the results of wargames and then investigating the characteristics that appear to differ from history. The next chapter will describe the data on which these characteristics were based. Chapter 3 will describe the characteristics and how they were derived. Chapter 4 will show how they applied in evaluating a particular wargame.

Table 1. Medical Blood Test

CHURCH MEDICAL CENTER

PATIENT'S NAME JOHN JONES D.O.B. 1 JULY 52 M X F

ACCOUNT NO. 62744 DATE 20 MARCH 87

PHONE NO. 294-5678 DOCTOR WILLIAM SMITH M.D.

CHEM 4 ☐ CHEM 13 ☐ CHEM 23 ☒

CHEMISTRY TEST	RESULTS	UNITS	EXPECTED RANGE
ALBUMIN	4.0	g/dl	4.0 – 5.0
ALK. PHOS.	53	u/l	20 – 92
BILIRUBIN T.	0.6	mg/dl	0.12 – 1.25
CALCIUM	8.0	mg/dl	7.7 – 9.5
CARBON DIOXIDE	29.9	mEq/l	23 – 32
✓ CHLORIDE	80	mEq/l	98 – 106
CHOLESTEROL	179	mg/dl	132 – 299
CREATININE	1.2	mg/dl	0.7 – 1.4
GGT	23	u/l	7 – 56
GLUCOSE	116	mg/dl	81 – 114
LDH	112	u/l	81 – 190
PHOSPHORUS	3.4	mg/dl	2.3 – 4.2
POTASSIUM	4.06	mmol/l	3.5 – 5.5
PROTEIN T.	6.6	g/dl	6.3 – 7.9
SGOT (AST)	23	u/l	7 – 32
SGPT (ALT)	33	u/l	3 – 31
SODIUM	141.4	mmol/l	135 – 150
✓ TRIGLYCERIDES	202	mg/dl	36 – 165
UREA NITROGEN (BUN)	13	mg/dl	7 – 27

CHAPTER 2

DATA ABOUT THE RESULTS OF HISTORICAL COMBAT

2-1. SOURCES OF DATA ABOUT HISTORICAL BATTLES

a. The data in this report was obtained from the only source of quantitative data about modern historical combat ever assembled that attempts to describe in detail both sides of the battlefield. This is the collection of data about 601 battles generated for various studies over the past 25 years by Colonel Trevor N. DuPuy and the the military historians at Data Memory Systems, Incorporated of Fairfax, Virginia. These data have been assembled under a contract to the US Army Concepts Analysis Agency and now constitute the Army's data base of historical battles.

b. Of these battles, 260 took place since 1937 and are candidates for use in establishing historical criteria of credibility. The term "battle" is used in this report to describe, as explained in the Glossary, both entire battles and engagements or phases of larger battles. Archives, interviews and books were used by the military historians who assembled it. Appendix C, the bibliography, lists the published reports that are the sources of this information, and Appendix D, Historical Data Used, lists the data about each battle.

c. About each battle, select elements of information were extracted from these reports covering the following characteristics of combat: terrain, tactics, weapons and outcomes, the latter covering attrition and movement. The variables in these categories are defined where necessary in the glossary and enumerated in the column headings of Appendix D.

d. Appendix D contains the complete records of the data on which the calculations in this report were based. To understand these criteria, it is helpful to understand certain peculiarities of this data. These will be described below. The items of data selected for analysis in this report were those that could have been obtained from a war correspondent at the scene of the conflict. This involved excluding characteristics of a battle that were later judgments of military historians rather than "observations." Accordingly, variables such as "success," "morale" and "training" were intentionally excluded. The intent, imperfectly realized perhaps, is to confine the data to the general type of evidence that might be obtained from a laboratory or a geological survey. It should be noted that the reports, listed in Appendix C, that contain this data have much more information about each battle than was used in this analysis.

e. Key elements of data on these battles and engagements were assembled in a table with 260 rows, one for each battle, and 45 columns, one for each characteristic or data element. From this table, a representative value of each characteristic was calculated. For categorical characteristics, such as weather, the mode or most frequently occurring value was used. For quantifiable characteristics such as width of front, the value at the median or 50th percentile of the ranked data was used. These modes and medians describe a battle consisting of:

A division attacking a division,
in a frontal attack against a fortified defense,
with 17,700 men attacking 8,500,
on an 8-kilometer front,
in mild, dry weather,
on rolling terrain,
with mixed cover,
without surprise,
with the attack producing a penetration,
and the defense resulting in a withdrawal.

These representative values from the historical data describe briefly what war has been like at the combined arms level for the last half century.

2-2. PECULIARITIES OF THE DATA ABOUT HISTORICAL BATTLES

a. Three aspects of the historical data on which the above description of battle was based distinguish it from the type of data normally used in war games. The first aspect is its incompleteness; only 80 percent of the 11,000 data cells in the table of battles could be filled. Only 17 of the 260 battles have all of the elements of data specified by the table. The missing entries represent items of data that in many cases can never be recovered. When, for example, the United States captured Okinawa in 1945, many Japanese command bunkers were cleared out with flame throwers, destroying all historical sources, both written and oral. For this reason, if no other, combat data cannot be analyzed like the data from proving grounds used in engineering and physics.

b. A second aspect of this data is illustrated in Table 2. Different wars and theaters are covered in varying levels of completeness. Some locations are sparsely covered because there were not many battles, such as Lebanon. Others are sparsely covered because no data has been accumulated, such as the war in Iraq. There is only one battle from Vietnam.

Table 2. Characteristics of the Data: Location of Battles

Location	No. of battles
West Europe (1940)	5
East Asia (1938-45)	6
East Europe (1939-42)	4
North Africa (1943)	8
Italy (1943-44)	64
East Europe (1943-45)	28
West Europe (1944)	25
West Pacific (1944-45)	32
Korea (1950)	11
Israel (1948)	9
Israel (1956)	4
Israel (1967)	22
Israel(1973)	33
Other locations	9

c. A third aspect is illustrated in Table 3; most battles were small or were fragments of longer or more extensive battles. While echelons above corps are represented, they were organizations that had been in combat for some time and were below authorized strength. Only about one battle in eight, for example, involved a unit with more than 100,000 troops. The historical data used in this report is primarily about divisions.

Table 3. Characteristics of the Data: Size of Forces

Echelon	Percent of battles	
	Attackers	Defenders
Army group	5%	3%
Army	7	10
Corps	14	9
Division	65	50
Brigade	8	27
Battalion	1	1

2-3. CHARACTERISTICS OF HISTORICAL BATTLES IN THE DATA

a. The battles in the data may be characterized in terms of their environments, the tactics attempted, and the observable results of combat. Table 4 characterizes the data in terms of environment. As may be seen, there is little combat in swamps, forests, or cities.

Table 4. Characteristics of the Data: Environment of Battles

Aspect of the environment	Percent of battles
TERRAIN	
Rugged	29%
Rolling	46
Flat	25
COVER	
Woods	1%
Mixed	65
Bare	20
Urban	1
Swamp	2
Desert	11

b. Table 5 characterizes the battles in terms of the tactics initially intended to be employed, that is, the maneuver by the attacker and the posture of the defender. The typical battle involves a frontal attack against a fortified defense. About one attack in eight employed any mobile form of maneuver, such as an envelopment or a mobile defense. Surprise, moreover, was present in less that 15 percent of the instances. As may be seen, the engagements represent routine battlefield tactics. Clausewitz noted that in his day, fancy tactics and battlefield brilliance seldom occurred in practice. In our day, the condition appears to still exist.

Table 5. Characteristics of the Data: Tactics and Postures

Tactics and postures of forces	Percent of battles
ATTACKER MANEUVER	
River crossing	10%
Frontal attack	73
Breakthrough	2
Envelopment	7
Double envelopment	6
Pursuit	2
DEFFENDER INITIAL POSTURE	
Hasty defense	24%
Prepared defense	30
Fortified defense	39
Mobile defense	1
Delay	5
Withdrawal	1

c. Table 6 characterizes the data in terms of different outcomes or observable results. As may be seen, about 75 percent of the engagements were successful for the attacker, but with very few overwhelming victories or defeats. In most cases, victory resulted in a penetration by the attacker accompanied by a withdrawal by the defender to renew the battle nearby a few days later. In general, what is described by this table is the routine of war rather than its high points.

Table 6. Characteristics of the Data: Outcomes of Battles

Outcome at end of battle	Percent of battles
ATTACKER	
Breakthrough	17%
Penetration	55
Repulsed	25
Other	3
DEFENDER	
Annihilation	5%
Withdrawal + heavy casualities	13
Withdrawal or delay	42
Stalemate	35
Pursuit of attacker	4
Truce or surrender	1

2-4. RELIABILITY OF THE DATA ABOUT HISTORICAL BATTLES

The military historians who gathered the data have offered their subjective judgments of its comparative reliability. In their opinion, the information about the Western European and Italian campaigns of World War II are the most accurate, since they were able to work from both United States war records and the German ones that became available after the surrender of Germany. The Korean data probably is the least reliable, since no North Korean records and little oral evidence was available. The Middle East war data lies somewhere in between, with data on the 1956 and 1973 wars being better than that on the 1948 and 1967 wars.

An independent audit of the source records on select battles by McDonald and another team of military historians (see Bibliography) produced many changes and a few additional data elements. It also produced discussion among the historians that resemble in tone arguments about the fall of the Roman Empire.

2-5. SUMMARY

In summary, a large table of military history was constructed with data about 260 battles during the last 50 years. Two-thirds of the battles took place in World War II, one third since 1945. The records on almost all

battles are incomplete, and one-fifth of the historical data called for by the table could not be supplied. From the data that were available, nevertheless, sets of rates and ratios were calculated that describe each battle. These values form the raw material from which to construct criteria of wargame credibility that will be described in the next chapter.

CHAPTER 3

CRITERIA OF WARGAME CREDIBILITY

3-1. FEATURES OF THE DATA AFFECTING THE METHODOLOGY USED. Having looked in Chapter 1 at the problem of evaluating wargame credibility and in Chapter 2 at the data on which to base an evaluation, let us turn to the criteria on which such a judgment might be based. The preceding chapter addressed historical data; the "observable" characteristics of each battle. This chapter will address the rates and ratios calculated from that data. Three points will be covered: features of combat that influence how the criteria were arrived at, the methodology for calculating them, and the values that resulted. Three statistical features of values calculated from historical data influence how these creditability criteria are arrived at: their variability, their skewedness, and their homogeneity.

a. The first feature of the rates and ratios is skewedness, which is illustrated by Figure 1. It shows, for one characteristic, the number of artillery pieces per kilometer of front, how the value varies from battle to battle. The frequency distribution is extremely skewed. The average or median for all characteristics of battle have a low value, but in every characteristic there is a long tail of values that stretch towards the right to extremely high values.

b. There is even an engagement on Okinawa, not plotted in Figure 1, where the United States brought to bear 440 guns per kilometer of front. Exactly the same type of distribution of values was observed for every other rate and ratio that were examined. Appendix E contains a series of graphs that show the frequency distributions of these characteristics.

c. Table E-1 of the appendix shows in numerical terms that all of the distributions are in a sense nonstandard. They do not resemble a normal distribution or even a symmetric one. This feature has an implication for how a benchmark should be established: calculating it in terms of an arithmetic average would be misleading. A few very high values in the data could lead to an average that was shifted to the right on the chart to the point where it represents a situation that had taken place only a very few times. In other words, the average would be overestimated. An average from Figure 1, for example, would state that the representative artillery density characteristic was approximately 30 guns per kilometer, a value higher than 80 percent of the actual battles from which it was derived.

d. A way to deal with this situation is to set the benchmark in terms of the median, a value of the characteristic exceeded by 50 percent of the battles. For the artillery density characteristic, it was 16 guns per kilometer. A second way to deal with this feature of the data is to use ranges rather than confidence intervals as a basis for the criteria of credibility. Values of a characteristic might be employed that contain 90 percent of the battles, or for a tighter criteria, 50 percent of them.

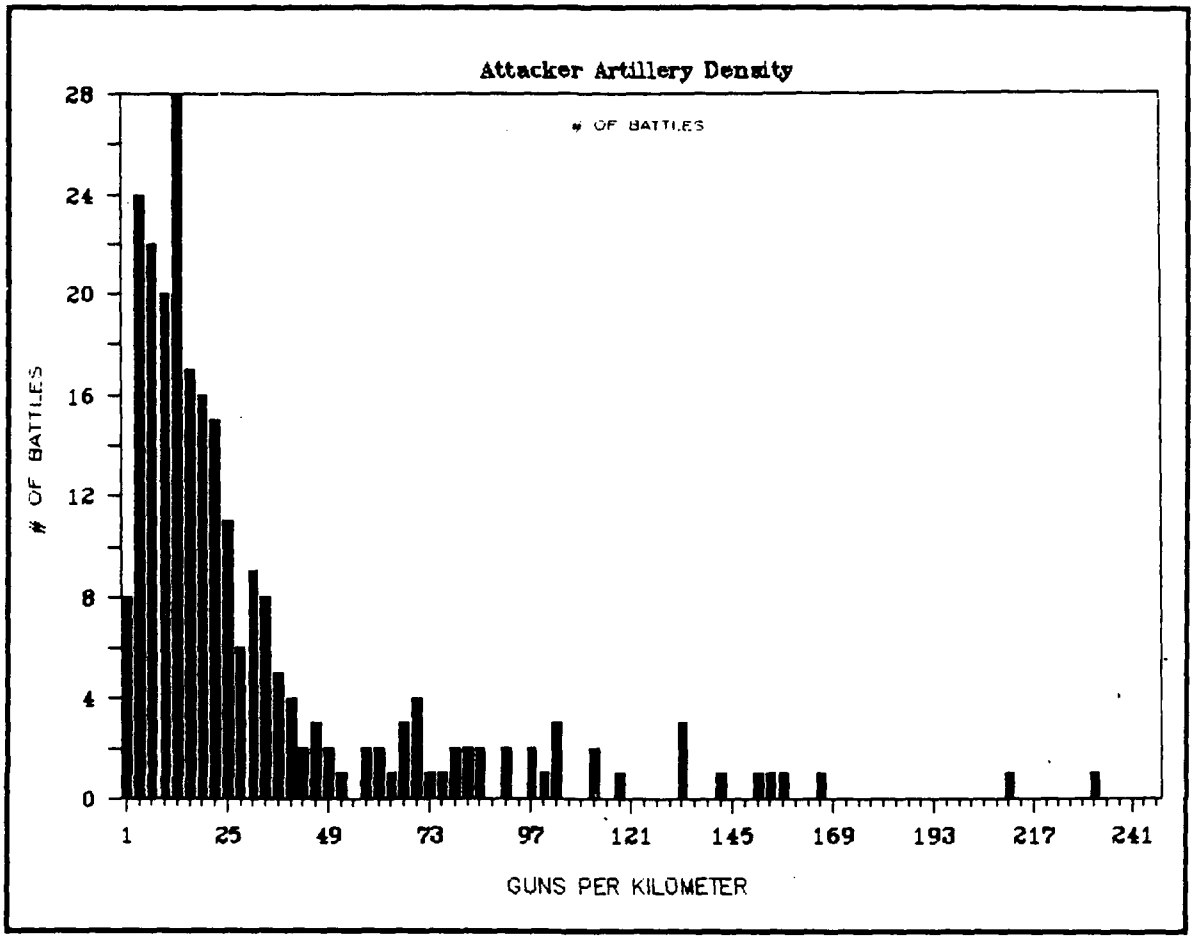

Figure 1. Skewedness of Characteristics

e. A second feature of the data, homogeneity, is illustrated by Figure 2. It plots the artillery per kilometer of front by campaign. The graph simplifies the actual analysis which was carried out in terms of 16 theaters or campaigns. The data arrayed in this fashion has two features relevant for our purposes. Firstly, the ranges are very wide for theaters. Secondly, the medians, while not identical, are very low for all of them. The medians are shown by the small diamond next to each stack of X's, each of which represents one battle. Thirdly, the variations for each theater are so wide that it is impossible to determine with any certainty whether the median might not change if the sample of battles were expanded. There is no apparent year, theater or campaign where it can be concluded with any certainty that a different pattern of artillery density began to be observable. This feature, too, has implications for selection of a methodology. It means that there is no statistically consistent procedure for selecting subsets of data on which to base the calculations. In other words, removing outliers or grouping it by theater is unlikely to improve the quality of the criteria.

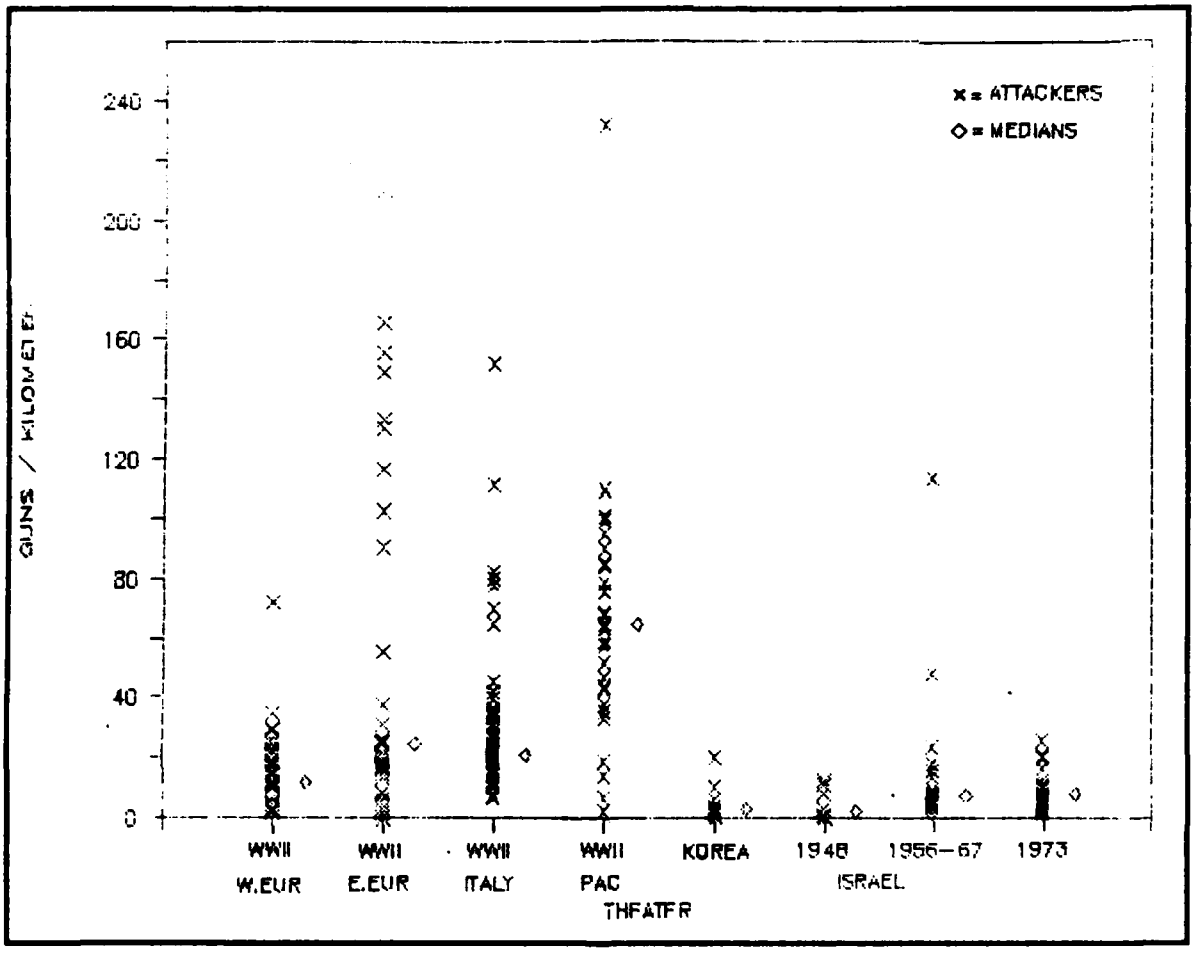

Figure 2. Homogeniety of Characteristics

f. Moreover, there appears to be no particular time during the last 50 years where a change in the pattern is observable. Considering the numerous changes in the nature of weapons and tactics that have been observed, this is surprising. The possibility of heterogeneity of data was tested by use of the Kruskal Wallis distribution free analysis of variance combined with Dunn's distribution free multiple comparison procedure based on rank sums. The results were the same: a hypothesis of no change over time or between theaters could not be rejected for this characteristic. The same hypothesis was tested for other characteristics of the data and could not be rejected for any of them. While this does not guarantee that no such differences actually developed, it does indicate that a logical criteria for rejecting some data and accepting others is not immediately apparent.

g. The third feature of the data, variability, is illustrated by Table 7. It shows, for select characteristics, the battle with the highest and with the lowest value for that characteristic. For example, advance rate during combat is shown at the bottom of the figure. The fastest rate of opposed advance against a determined defense occurred in 1967 during the Sinai

campaign, where the Israelis moved forward at the rate of approximately 45 kilometers per day. The slowest rate occurred during one of the engagements on Okinawa in 1945 when the United States moved forward at the rate of 100 meters per day. The range within which the characteristics of a battle may be found is exceedingly wide.

Table 7. Variability of Characteristics

Characteristic	Type of characteristic	Year	Attacker & Defender	Value of characteristic	Ratio of High to Low Values
Force ratio men (atkr:dfdr)	High:	1967	Egypt:Israel	17:1	57:1
	Low	1945	Japan:USA	.3:1	
Force ratio artillery (atkr:dfdr)	High:	1945	USA:Japan	50:1	450:1
	Low:	1948	Israel:Syria	.11:1	
Mortar density dfdr (wpns/km)	High:	1943	Britain:Germany	132	730:1
	Low	1973	Egypt:Israel	0.19	
Artillery density atkr (wpns/km)	High:	1944	USA:Japan	444	2200:1
	Low	1948	Israel:Jordan	0.2	
Casualty rate atkr (% per day)	High:	1945	USA:Japan	96%	740:1
	Low	1944	Britain:Germany	0.13%	
Tank loss rate atkr (% per day)	High:	1967	Israel:Syria	92%	150:1
	Low	19441	USA:Germany	.63%	
Advance rate (km per day)	High:	1967	Israel:Egypt	45	450:1
	Low	1945	USA:Japan	0.1	

h. The ratios for all of the initial conditions and outcomes of combat are equally high, and it appears to be a feature of war that key characteristics can vary quite widely. Perhaps this should not be surprising; combat is a risky business. Even though it is usually routine, it can at times be horribly nonstandard. The data reflects this situation; almost anything can happen, and it has. This wide variability of characteristics appears to be an aspect of war that wargames, to be creditable, should be capable of duplicating. This wide variability also has an implication for the manner in which criteria of credibility are selected: The standards must recognize a very wide range of acceptable outcomes.

3-2. AN IMPLICATION OF THE DATA FOR WARGAME VALIDATION

Collectively, these three features of the data have an implication for validating wargames: almost any result of a wargame or simulation can be considered as credible, in the sense that something like it has probably taken place in real combat and might be expected to repeat itself in the future. Almost every possible combination of weapons, tactics, and outcomes may be found at one time or another in the past. Consequently, the demand,

often made, that a wargame must be able to reproduce history appears to be a specious one. Merely reproducing a particular battle or campaign that has occurred in the past is not enough to ensure that a wargame is credible. To say something believable about war in the future, more is needed than reproducing an historical battle. Even if the wargame cannot match a particular battle, it may still be quite representative of battles in general. Conversely, if it did match a particular battle, it may not be useful if the battle was exceptional and did not represent the typical instance of combat.

3-3. METHODOLOGY USED FOR ESTABLISHING THE CRITERIA

a. The preceding observations about the measurements resulting from combat provide guidelines for how computations of the benchmarks could be carried out. As a result, the following were adopted:

(1) Use the data for all of the 260 battles, since there is no valid basis for rejecting any battle, war, or theater.

(2) Use "robust" measures of battle characteristics that are insensitive to very large or very small outliers and to the extreme skewedness of the data.

(3) Employ measures of battle characteristics that recognize the wide variation in numerical characteristics found among battles.

b. As a consequence, the actual computations involved a procedure consisting of the following steps:

(1) Organize the data in a table with 260 rows, one for each battle, and 41 columns, one for each objective characteristic of the battle in the historical data.

(2) Calculate for each battle, where missing data does not prevent it, the ratios and percentages that describe its principal characteristics.

(3) Ignore ratios and percentages where a characteristic could not be computed because of missing data elements needed to compute it.

(4) For characteristics that could be calculated, rank their values.

(5) Determine the range of characteristics between the 5 to 95 percentiles of a characteristic as a criterion of "plausibility."

(6) Determine the interquartile range of characteristics between the 25 to 75 percentiles of a characteristic as a criterion of "centrality."

(7) Determine the median value of each characteristic.

c. This procedure produced two tables, each displaying one set of numbers describing its beginning and the second describing its end. These two sets are referred to as the "initial conditions" and the "outcomes" of the engagement. Because of missing elements of data, some of these ratios and rates are based on more instances than others. Casualty rates, for example,

can be calculated for 97 percent of the battles, while the force ratio for mortars is known for only 45 percent of them. Table E-1 shows the number of battles on which each criterion of creditability was established.

3-4. CREDIBILITY CRITERIA THAT WERE ESTABLISHED

a. Table 8 shows the first set of criteria derived from the historical data. They represent a set of criteria of "plausibility." Any simulation with a scenario that was compatible with these ranges cannot be considered unrealistic. As an example, if the attacker's casualties are between 1/5 of 1 percent per day and 6 percent per day, it represents plausible results. Moreover, if the wargame has simulated a large number of battles, 50 percent of them should be less than the median casualties of 9/10ths of one percent per day of combat.

b. Table 9 shows the second set of benchmarks. They represent a set of criteria of "centrality". Such a set is needed because a wargame represents not just a single battle, but is rather a surrogate for a great number of battles likely to take place during the war or campaign being examined. If the wargame results are too high or too low, even though plausible, they will give a false idea of the requirements for weapons and supply during the overall campaign. The simulated battle has to be near the middle of the expected battles that might take place. That is, it has to be central. As an example, unless the attacker's casualties are between $\frac{1}{2}$ percent and 2 percent per day, the extrapolation of the results of one simulated battle to all of the battles in an entire campaign could be misleading.

3-5. ADVANTAGES AND DISADVANTAGES OF THEIR USE

a. The condition of the data brings with its use some advantages and some disadvantages of using the criteria of credibility. First, the advantages: the data from which they are derived is all of and the only available quantification of tactical, combined arms combat. Tables 8 and 9 are the first time that it has been assembled in a form useful to the practicing wargamer. They enable wargame results to be tested in a straightforward fashion but do not ensure in any absolute sense that results of a wargame are "right." The tables have the potential of focusing a spotlight on unrealistic scenarios and optimistic weapons performance that might unintentionally distort the development of the military conclusions.

Table 8. Plausibility Criteria

Characteristic		Criteria		
		Lower	Median	Upper
INITIAL CONDITIONS				
Force ratio (atkr:dfdr)	-Men	.57:1	1.9:1	6.3:1
	-Mortars	.21:1	1.6:1	13:1
	-Guns	.24:1	1.7:1	15:1
Troop density (men/meter)	-Atkr	.45	2.5	9.3
	-Dfdr	.30	1.3	5.7
Weapon system density ("systems"/km)	-Atkr	24	82	600
	-Dfdr	3.7	71	610
Rifle squad density (squads/km)	-Atkr	1.1	30	120
	-Dfdr	1.3	6.7	80
Mortar density (weapons/km)	-Atkr	.76	13	110
	-Dfdr	.63	7.2	38
Antitank weapon density (weapons/km)	-Atkr	1.5	9.8	82
	-Dfdr	.59	4.2	75
Tank density (tanks/km)	-Atkr	2.9	18	80
	-Dfdr	1.3	6.9	45
Artillery density (weapons/km)	-Atkr	1.7	16	110
	-Dfdr	1.5	8.9	50
Air defense density (weapons/km)	-Atkr	2.2	7.1	35
	-Dfdr	1.1	5.0	36
Close air support density (sorties/km/day)	-Atkr	.31	5.5	43
	-Dfdr	.2	2.6	29
OUTCOMES				
Casualty rate (%/day)	-Atkr	0.2%	0.93%	5.5%
	-Dfdr	0.3	2.8	22
Casualty ratio	-(Atkr-Dfdr)	.08:1	.68:1	7.0:1
Tank loss rate (%/day)	-Atkr	0%	4.3%	44%
	-Dfdr	.5	12	53
Advance rate	-(km/day)	0	1.7	21
Combat intensity	-(hours/day)	3	10	19

Table 9. Centrality Criteria

Characteristic		Criteria		
		Lower	Median	Upper
INITIAL CONDITIONS				
Force ratio (atkr:dfdr)	-Men	1.1:1	1.9:1	3.0:1
	-Mortars	.67:1	1.6:1	4.6:1
	-Guns	.87:1	1.7:1	3.7:1
Troop density (men/meter)	-Atkr	1.3	2.5	4.6
	-Dfdr	.72	1.3	1.9
Weapon system density ("systems"/km)	-Atkr	54	82	130
	-Dfdr	30	71	150
Rifle squad density (squads/km)	-Atkr	7.6	30	71
	-Dfdr	1.9	6.7	21
Mortar density (weapons/km)	-Atkr	5.0	13	36
	-Dfdr	3.2	7.2	13
Antitank weapon density (weapons/km)	-Atkr	4.6	9.8	19
	-Dfdr	2.2	4.2	13
Tank density (tanks/km)	-Atkr	9.7	18	31
	-Dfdr	3.5	6.9	14
Artillery density (weapons/km)	-Atkr	7.6	16	31
	-Dfdr	4.8	8.9	16
Air defense density (weapons/km)	-Atkr	4.5	7.1	14
	-Dfdr	2.9	5.0	12
Close air support density (sorties/km/day)	-Atkr	1.6	5.5	14
	-Dfdr	1.0	2.6	7.5
OUTCOMES				
Casualty rate (%/day)	-Atkr	.57%	.93%	2%
	-Dfdr	1.2	2.8	5.7
Casualty ratio	(atkr-dfdr)	.26:1	.68:1	1.8:1
Tank loss rate (%/day)	-Atkr	1.7%	4.3%	14%
	-Dfdr	4.9	12	27
Advance rate	(km/day)	.40	1.7	5
Combat intensity	(hours/day)	7.3	10	13

b. Use of Tables 8 and 9 also has disadvantages. The data on which they are based are far from perfect, and their utility will have to be tested by use. It has missing items for most battles, and for some campaigns it is of better quality than for others. It does not present a neat, closely defined picture of combat that can be applied to wargame results in a fashion that guarantees the reliability of the conclusions reached. These data are not like the weapons test data used in many wargames, which has been gathered under controlled conditions and can be evaluated within the framework of well understood statistical concepts. The main disadvantage of these benchmarks is that they cannot be applied mechanically.

c. Even if the data were perfect, moreover, there is another consideration in using it: the next war has never been like the last one. Every new war differs from its predecessor in some surprising and usually unpleasant way. Examples are the effects of the machine gun in 1914 and the tank in 1939. On the other hand, many of the features remain the same from war to war. Infantry density in 1914 did not differ much from that of the Russo-Japanese war of 1904. Moreover, the organization and tactics of a German infantry division in 1939 were about the same as in 1918. In applying any criterion of creditability, nevertheless, the uncertainty remains. The problem of using Tables 8 and 9 is that we do not know whether they describe the aspects of war that will remain the same or those that will change.

3-6 SUMMARY. Two sets of criteria of credibility have been proposed, a "plausibility" set and a "centrality" set. In the next chapter, a procedure will be described for using the benchmarks to evaluate a specific simulated battle.

CHAPTER 4

APPLICATION OF THE CRITERIA TO A PARTICULAR WARGAME

4-1. PURPOSE OF THE EVALUATION

a. In this chapter, the criteria from the tables developed in the last chapter will be used to evaluate battles from a particular wargame. The simulation employed will be COSAGE, the Combat Sample Generator, a division-level model of combined arms combat that represents the design characteristics of individual weapons in a battle on terrain accurate to the 100-meter interval using the tactics and organizations appropriate to the nationalities involved.

b. The intent here will be to determine the "credibility" of the results of the game simulating combat in a hypothetical battlefield called Omaha. The results evaluated are actual ones generated by COSAGE as it was being calibrated for a particular study. In other words, we will use the criteria to think about whether any of the inputs or results were so extreme that a second look should be given before making the final simulation run of the scenario.

4-2. METHOD OF APPLYING THE CRITERIA

a. The determination is carried out by comparing rates from the wargame with ranges from the historical data. Two forms have been devised for carrying out this comparison. Blank copies of these forms are in Appendix F and may be reproduced by users. The first form is used to assess the credibility of simulated combat by one force, either Red or Blue. The form has been filled out with wargame results for the US defending division and is shown in Table 10. The benchmarks from Table 8 are transcribed to the leftmost three columns, and the results of the game runs to the rightmost of them. As can be seen, the US division had about two tanks and seven pieces of artillery per kilometer of front. The results, fighting 14 hours per day, were for the US division a casualty rate of about 18 percent per day and a movement in retrograde of about 15 kilometers per day.

b. Some of the wargame results for the US division were, as might be expected, above or below the median, but all of them were within the upper and lower plausibility benchmarks for defending forces. Consequently, we can have some assurance that the simulated performance of this force was not utterly farfetched.

c. The next step is to repeat the comparison for the Red unit. This is illustrated in Table 11, which is the same form filled out for the other unit in the Omaha scenario. As can be seen, the Red attacking corps had about 13 tanks and 24 pieces of artillery per kilometer of front. For the corps, the results were a casualty rate of about 8 percent per day.

Table 10. Force Worksheet - Defender

CREDIBILITY OF SIMULATED COMBAT

Run Date: 6 OCT 78 Scenario: OMAHA [ ] Attacker

Model: COSAGE Unit: BLUE DIV [X] Defender

Type of Test: [ ] Centrality [X] Plausibility

Characteristic		TYPE OF CRITERIA FROM MILITARY HISTORY Measure	VALUES OF THE CRITERIA Lower	Median	Upper	RESULTS OF SIMULATED COMBAT Value	Status
INITIAL CONDITIONS							
RELATIVE ADVANTAGE	Troop	ratio(atk:def)	.57:1	1.9:1	6.3:1	3.3	OK
	Mortar	ratio(atk:def)	.21:1	1.6:1	13:1	8.2	OK
	Gun & Missile	ratio(atk:def)	.24:1	1.7:1	15:1	3.2	OK
TARGET DENSITY	Troop	men/meter	.30	1.3	5.7	N.A.	—
	Weapon System	"systems"/km	3.7	71	610	N.A.	—
WEAPON DENSITY	Rifle Squad	squads/km	.13	6.7	80	N.A.	—
	Mortar	mortars/km	.63	7.2	38	2.8	OK
	Antitank	AT weapons/km	.59	4.2	75	18	OK
	Tank	tanks/km	1.3	6.9	45	1.9	LOW-
	Artillery	guns & msls/km	1.5	8.9	50	6.6	OK
	Air Defense	weapons/km	1.1	5.0	36	1.5	OK
	Close Air	sorties/km/day	.2	2.6	29	.55	OK
OUTCOMES							
TROOP ATTRITION		% / day	.3	2.8	22	18	HIGH-
CASUALTY RATIO		atkr:dfdr	.08:1	.68:1	7.0:1	1.5	OK
TANK LOSSES		% / day	.5	12	53	1.8	OK
OPPOSED MOVEMENT		km / day	0	1.7	21	.15	LOW
COMBAT INTENSITY		hrs / day	3	10	19	14	OK

Table 11. Force Worksheet - Attacker

CREDIBILITY OF SIMULATED COMBAT

Run Date: 6 OCT 78 Scenario: OMAHA [X] Attacker

Model: COSAGE Unit: RED ARMY [ ] Defender

Type of Test: [ ] Centrality [X] Plausibility

Characteristic	Measure	Lower	Median	Upper	Value	Status
INITIAL CONDITIONS						
RELATIVE ADVANTAGE Troop	ratio(atk:def)	.57:1	1.9:1	6.3:1	3.3	OK
Mortar	ratio(atk:def)	.21:1	1.6:1	13:1	8.2	OK
Gun & Missile	ratio(atk:def)	.24:1	1.7:1	15:1	3.2	OK
TARGET DENSITY Troop	men/meter	.45	2.5	9.3	N.A.	—
Weapon System	"systems"/km	24	82	600	N.A.	—
WEAPON DENSITY Rifle Squad	squads/km	1.1	30	120	N.A.	—
Mortar	mortars/km	.76	13	110	23	OK
Antitank	AT weapons/km	1.5	9.8	82	56	OK
Tank	tanks/km	2.9	18	80	13	OK
Artillery	guns & msls/km	1.7	15	110	24	OK
Air Defense	weapons/km	2.0	7.1	35	21	OK
Close Air	sorties/km/day	.31	5.5	43	.2	LOW
OUTCOMES						
TROOP ATTRITION	% / day	.2	.93	5.5	7.9	HIGH
CASUALTY RATIO	atkr:dfdr	.08:1	.68:1	7.0:1	1.5	OK
TANK LOSSES	% / day	0	4.3	44	18	OK
OPPOSED MOVEMENT	km / day	0	1.7	21	15	OK
COMBAT INTENSITY	hrs / day	3	10	19	14	OK

4-3. RESULTS OF THE EVALUATION

a. Some of the wargame results for the Red corps were above or below the median benchmark, but all of them, with two exceptions, were within the upper and lower criteria of plausibility for attacking forces. The first exception is that the corps' casualty rate is on the high side of available evidence. This does not say that it has not happened in the past--only that it has not happened very often. The second is that the Red corps used far fewer air sorties than has been normal. Perhaps something is wrong with the scenario or the inputs to the game. Since the US weapons density is within range and the Red target density is within range, it could be that some of the Blue weapons have been simulated at too high a level of effectiveness. It could also be that some of the data have been entered incorrectly or that the maneuver of Red forces is more aggressive than has usually taken place with actual forces. It could be that nothing at all is wrong, and that the particular scenario, TOEs, and tactics are such that one should expect non-traditional results.

b. Some of the benchmarks are marked "N/A," to indicate that they are not applicable. This is because this particular wargame represents combat selectively; nonessential details about rifle squads were intentionally left out of the model to provide more room in computer memory about weapons, which are its prime concern. This sort of tradeoff has to be made all the time in building combat models, and any procedure for assessing their creditability should have the capability of being applied without addressing a complete enumeration of every weapon in a simulated battle.

c. In summary, the results of this particular set of wargame results do not appear to be less than credible in terms of the benchmarks. Consequently, the model that generated them should be examined carefully in terms of tactics and data entry.

d. Assuming the final runs of a wargame have been made, another question arises: can the results be relied on to estimate the characteristics of a series of future battles? Being "creditable" leaves room, as noted in Chapter 3, for a very wide range of battlefield characteristics. Most of the time, a wargame run is used for much more than the analysis of a particular force in a particular setting. It is, in a sense, a surrogate for all the battles that could occur in the campaign or contingency plan being examined. The results should, as a consequence, be representative or "central." To evaluate this aspect the above evaluation has to be repeated using the centrality benchmarks in Table 9. This involves filling out two more of the forms, one for each force.

e. Since getting an insight into wargame results often leads to a comparison of different forces in the same terrain or the same opponents with different tactics, a third and fourth copy of the form might be prepared as well to reflect the additional forces or scenario. Since the comparison becomes a bit more intricate, a second form has been devised, a scenario worksheet. It is nothing more than a transcription of the rightmost columns of the force worksheets, and an example is shown in Table 12. This particular example, it should be noted, summarizes the results of evaluating Omaha in terms of centrality rather than plausibility. The four force worksheets behind Table 12 are not shown here.

Table 12. Scenario Worksheet

COMPARISON OF SIMULATED BATTLES

Run Date: 6 OCT 78 Type of Test: (X) Centrality [ ] Plausibility

Model: COSAGE Scenario: OMAHA

TYPE OF CRITERIA FROM MILITARY HISTORY			BATTLE 1		BATTLE 2		BATTLE	
			RED	BLUE	RED	GREEN		
Characteristic		Measure	CORPS	DIV	CORPS	DIV		
			Atkr	Dfdr	Atkr	Dfdr	Atkr	Dfdr
INITIAL CONDITIONS								
RELATIVE ADVANTAGE	Men	ratio(atk:def)	HIGH					
	Mortars	ratio(atk:def)	HIGH					
	Guns & Msls	ratio(atk:def)						
TARGET DENSITY	Troop	men/meter						
	Weapon System	"systems"/km						
WEAPON DENSITY	Rifle Squad	squads/km						
	Mortar	mortars/km						
	Antitank	AT weapons/km	HIGH	HIGH	HIGH	HIGH		
	Tank	tanks/km		LOW		LOW		
	Artillery	guns & msls/km						
	Air Defense	weapons/km	HIGH	LOW	HIGH	LOW		
	Air Support	sorties/km/day	LOW	LOW	LOW	HIGH		
OUTCOMES								
TROOP ATTRITION		% / day	HIGH	HIGH	HIGH	HIGH		
CASUALTY RATIO		atkr:dfdr						
TANK LOSSES		% / day	HIGH	LOW				
OPPOSED MOVEMENT		km / day	HIGH		HIGH			
COMBAT DURATION		hrs / day	HIGH		HIGH			

f. Table 12 shows the results of runs of a Red corps against a US division and of the same corps in the same location against an allied Blue division. In terms of being representative of combat in general, the following aspects of simulating this particular battle appear surprisingly high for both sides:

force ratio of troops
antitank weapon density
casualty rate
rate of opposed movement
hours of combat per day

The density of air defense weapons, moreover, appears high for an attacker and low for a defender, at least in comparison with the past.

g. While none of these out of bounds conditions are absolute verdicts either for or against the wargame results about Omaha, they do indicate the need for a careful review the way it is working.

4-4. CONCLUSION

The criteria of credibility cannot be applied in a mechanical fashion. For an analyst to conclude that a simulated battle is either "implausible" or "noncentral," consideration should be given to other factors that influence combat but that are not measured by the numerical criteria in Tables 8 and 9. While the procedure just described is the first step in the assessment of wargame credibility, a second step is equally important: thinking about the results.

CHAPTER 5

FUTURE WORK

5-1. STATISTICAL BASED RESEARCH

a. A few impressions have forced themselves on the author's attention in carrying out this research. They have to do with needed work in order to validate the tactical realism of wargames.

b. Further analysis of this data might produce "better" estimates of the ranges and medians of the characteristics, or even open the possibility of estimating useful formulas for particular assets of combat. Such research would depend, however, on new developments in the statistical theory related to (1) multivariate and nonparametric detection of outliers and to (2) exploratory data analysis. Usable tools of analysis in these areas may not now exist. This is because of the rather nonstandard distribution of the values of combat characteristics. The utility of historical data to wargaming as a consequence would appear to lie in simple tabulations making rather crude data useful rather than in analyzing it with statistical procedures copied from the physical sciences.

5-2. TACTICALLY MEANINGFUL PRINTOUTS

It is discouraging to validate wargames with advanced statistics when the printout of a typical wargame consists of huge piles of obscure detail. The first step is to make the obvious clear. With wargame printouts, the situation now is similar to the owner of a business who wants to know whether or not to build a new factory. The comptroller thereupon carts in a stack of printouts of the spare parts inventory of every plant. The owner looks surprised, and the comptroller returns with another load of listings, this time of every accounts receivable entry on the books of the company and the sick leave records of all its employees. The owner, thereupon, gives up and goes to an outside accounting firm to get a one page financial statement that tells him where he stands. Wargaming is in much the same situation, the computers don't printout "the bottom line." A report similar to Table 11 should be programmed to produce standardized output of every simulation. Otherwise, management really has nothing to review. Table 13 suggests Army wargames and simulations in need of such summaries of overall tactical operations.

5-3. DATA ABOUT VIETNAM BATTLES

It is difficult to recognize, as noted earlier, which factors change and which ones remain constant in war. The engineering and ballistics characteristics of the machinegun were known in 1914, and with excruciating precision. That didn't help very much in the trenches of Flanders. There was no operational data about the interactions in its use along with other weapons. For modern technology the interactions have been observed most recently during the battles in Vietnam. Surprisingly the only data base of Army casualties in Vietnam is being prepared now by the Navy. Quantitative data showing a balanced picture of Vietnam battles should be assembled and disseminated to the Army study community.

Table 13. Wargames Requiring Tactical Information Displays

Game	Echelon repre-sented	Owned by
CARMONETTE	Battalion	TRAC - White Sands
CEM	Theater	Concepts Analysis Agency
FORCEM	Theater	Concepts Analysis Agency
JANUS	Brigade	Lawrence Livermore Lab
JTLS	Theater	Joint Chiefs of Staff
VECTOR 2	Corps	TRAC - Leavenworth

APPENDIX A

CONTRIBUTORS

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APPENDIX B

STUDY DIRECTIVE

1. **PURPOSE OF STUDY DIRECTIVE.** To direct the development of an historical knowledge base for assessing realism of combat simulations and wargames.

2. **STUDY TITLE.** Benchmarks.

3. **BACKGROUND**

a. No readily available quantitative measures exist that provide for comparison between the results of historical combat and the results of simulations and wargames.

b. This CAA Fellewship effort has been designed to alleviate this deficiency. It will produce tables of data based on actual battles and sets of formats to summarize key aspects of simulated combat.

4. **STUDY PROPONENT.** Director, U. S. Army Concepts Analysis Agency.

5. **STUDY AGENCY.** Agency Fellowship Program.

6. **TERMS OF REFERENCE**

a. Objective. To develope relationships of various parameters of combat that are useful in comparing the results of combat simulations with historical combat.

b. Scope. Brigade, division, and corps-level battles. The data required for these battles will be derived from the combat history data base at CAA (as sanitized based on the CHASE Study).

c. Timeframe. 1939-1982.

d. Assumptions

(1) Some relationships that are developed from the CAA combat history data base can show key characteristics of combat in the past that are always relevant.

(2) Wargame evaluations can be done with sets of ratios in much the same way as is analysis of financial statements.

(3) Subjective judgments are ultimately more important than objective benchmarks but cannot be developed until benchmarks are developed.

e. Benefits. The results from this fellowship can be useful to four groups, each of which is concerned with evaluating the results of CAA models: CAA management, project leaders, analysts, and HQDA action officers. These results can provide a warning of simulated combat results that are likely to become controversal; guide change in models; and alert data preparation personnel to critical areas.

f. Essential Elements of Analysis

(1) How were the ratios used to establish the parameters (i.e., the benchmarks) defined?

(2) What data will be used from the data base to establish the ratios?

(3) Will the initial condition ratios be useful?

(4) Will the following ratios about the results of actual combat be useful in conducting an analysis?

(5) Is the methodology proposed for using the data one that can be applied by CAA personnel?

7. RESPONSIBILITIES

a. RS. Provide access to a personal computer for use by the CAA fellowship during the study.

b. CAA. Provide a data entry assistant for 1 month.

8. MILESTONES

a.	Initial ARB	1 April 1987
b.	Battles files generated	29 April 1987
c.	Battles files revised	19 May 1987
d.	Benchmarks calculated	1 July 1987
e.	Output formats designed	24 July 1987
f.	IPR	3 August 1987
g.	Final ARB	15 October 1987
h.	PRB completed	20 October 1987
i.	Report completed	1 November 1987

APPENDIX C

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APPENDIX D - HISTORICAL DATA USED

Identification							Environment				Tactics			
Battle			Nations		Echelon				Humi-	Temp-	Attacker			Major
Name	Location	Date	Atkr	Dfdr	Atkr	Dfdr	Terrain	Cover	dity	ture	Maneuver	Wdth	Dpth	Suprs
Abu Ageila-Umkatef	Sinai	Oct-56	Is	Egy	Div	Rgt	Flat	Bare	Dry	Hot	Frontal Atk	6		No
Abu Ageila-Umkatef	Sinai	Jun-67	Is	Egy	Div	Div	Flat	Mixed	Dry	Hot	Envelopment	8	9	Atkr
Acre	Sinai	May-48	Is	Egy	Rgt	Rgt	Flat	Mixed	Dry	Temp	Frontal Atk	2		No
Adabiya	Sinai	Oct-73	Is	Egy	Div	Corp	Rolling	Desert	Dry	Hot	Envelopment	13	7	No
Ageila-Rafah-Ayin	Sinai	Dec-48	Is	Egy	Div	Div	Flat	Bare	Dry	Temp	Frontal Atk	2		No
Ahmadiyeh	Golan	Oct-73	Syr	Is	Div	Rgt	Rugged	Bare	Dry	Hot	Frontal Atk	8	15	Atkr
Alam Halfa	N.Africa	Aug-42	Ger+	Brit	Army	Army	Flat	Bare	Dry	Hot	Envelopment	90		No
Alamein 2	N.Africa	Oct-42	Brit	Ger+	Army	Army	Flat	Bare	Dry	Temp	Penetration	61		Atkr
Alamein-Bridgehead	N.Africa	Oct-42	Brit	Ger+	Army	Army	Flat	Bare	Dry	Temp	Frontal Atk	61		No
Alamein-Lightfoot	N.Africa	Oct-42	Brit	Ger+	Army	Army	Flat	Bare	Dry	Temp	Penetration	61		Atkr
Alamein-Supercharg	N.Africa	Nov-42	Brit	Ger+	Army	Army	Flat	Bare	Dry	Temp	Penetration	61		No
Amphitheater	Italy S	Sep-43	Brit	Ger	Div	Rgt	Rolling	Mixed	Dry	Temp	Frontal Atk	13		No
Anzio Breakout	Italy R	May-44	US	Ger	Div	Div	Flat	Mixed	Light	Temp	Frontal Atk	6		Atkr
Anzio-Albano Road	Italy R	May-44	Brit	Ger	Div	Div	Flat	Mixed	Light	Temp	Frontal Atk	6		No
Aprilia 1	Italy A	Jan-44	Brit	Ger	Div	Div	Flat	Mixed	Heavy	Temp	Frontal Atk	7		Atkr
Aprilia 2	Italy A	Feb-44	Ger	Brit	Div	Div	Flat	Mixed	Dry	Cold	Frontal Atk	2		No
Ardea	Italy R	May-44	Brit	Ger	Div	Div	Rolling	Mixed	Dry	Temp	River Cross	9		No
Ardennes	W.Europe	May-40	Ger	Fr	ArGp	Army	Rolling	Mixed	Light	Temp	River Cross	96		
Arracourt	W.Europe	Sep-44	Ger	US	Div	Rgt	Rolling	Mixed	Light	Temp	Frontal Atk	10		No
Arras	W.Europe	May-40	Brit	Ger	Rgt	Rgt	Rolling	Mixed	Dry	Temp	Envelopment	5		No
Baerendorf 1	W.Europe	Nov-44	US	Ger	Div	Div	Rolling	Mixed	Dry	Cold	River Cross	4		No
Baerendorf 2	W.Europe	Nov-44	US	Ger	Div	Div	Rolling	Mixed	Dry	Cold	Frontal Atk	11		No
Banias-Masaada	Golan	Jun-67	Is	Syr	Rgt	Rgt	Rugged	Mixed	Dry	Hot			5	No
Bastogne	W.Europe	Dec-44	Ger	US	Corp	Rgt	Rolling	Mixed	Light	Cold	Frontal Atk	12		No
Battipaglia 1	Italy S	Sep-43	Ger	Brit	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	5		No
Battipaglia 2	Italy S	Sep-43	Brit	Ger	Div	Rgt	Rolling	Mixed	Dry	Temp	Frontal Atk	12		No
Bayonette Line	Korea	Jun-51	US	NKor	Div	Army	Rugged		Light	Temp	Frontal Atk	32		No
Bekka Valley	Lebanon	Jun-82	Is	Syr	Corp	Div	Rolling	Desert	Dry	Hot	Frontal Atk	26		No
Berezina River	E.Europe	Jun-44	USSR	Ger	Corp	Div	Flat	Swamp	Dry	Temp	Dbl Envelop	10		No
Bir Gifgafa	Sinai	Jun-67	Egy	Is	Rgt	Rgt	Flat	Desert	Dry	Hot	Frontal Atk	5	2	No
Bir Hama-Gifgafa	Sinai	Jun-67	Is	Egy	Div	Div	Flat	Desert	Dry	Hot	Envelopment	10	6	No
Bir Lahfan	Sinai	Jun-67	Is	Egy	Div	Div	Flat	Desert	Dry	Hot	Frontal Atk	10	5	No
Bir Rud Salim	Sinai	Nov-56	Is	Egy	Rgt	Rgt	Flat	Bare	Dry	Hot	Frontal Atk			No
Birhassna-Thamada	Sinai	Jun-67	Is	Egy	Div	Div	Flat	Desert	Dry	Hot	Frontal Atk	7	5	No
Boos	W.Europe	Jun-40	Fr	Ger	Co	Co	Rolling	Mixed	Light	Temp	Frontal Atk	1		No
Bourgaltroff	W.Europe	Nov-44	US	Ger	Div	Div	Rolling	Mixed	Light	Cold	Frontal Atk	11		No
Boutmiya	Golan	Jun-67	Is	Syr	Div	Div	Rugged	Mixed	Dry	Hot			8	No
Bowling Alley 1	Italy A	Feb-44	Ger	US	Corp	Div	Flat	Mixed	Dry	Temp	Frontal Atk	10		Atkr
Brody 1	E.Europe	Jul-44	USSR	Ger	Corp	Rgt	Flat	Swamp	Dry	Temp	Frontal Atk	6		No
Brody 2	E.Europe	Jul-44	USSR	Ger	Corp	Div	Flat	Swamp	Dry	Temp	Frontal Atk	7		No
Burbach-Durstel	W.Europe	Nov-44	US	Ger	Div	Div	Rolling	Mixed	Light	Cold	Frontal Atk	11		No
Butte Line	Korea	Feb-51	US	NKor	Div	Army			Dry	Temp	Frontal Atk	19		No
Caiazzo	Italy V	Oct-43	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	River Cross	9		No
Calabritto	Italy V	Dec-43	Brit	Ger	Div	Div	Rugged	Mixed	Light	Temp	Frontal Atk	2		No
Cambrai	W.Europe	May-40	Ger	Fr	Div	Div	Rolling	Mixed	Light	Temp	Frontal Atk	2		
Campoleone 1	Italy A	Jan-44	Brit	Ger	Div	Div	Flat	Mixed	Dry	Cold	Frontal Atk	11		No
Campoleone 2	Italy A	Feb-44	Ger	Brit	Div	Rgt	Flat	Mixed	Dry	Temp	Dbl Envelop	11		No
Campoleone Station	Italy R	May-44	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	7		No
Canal 1	Italy V	Oct-43	Brit	Ger	Div	Div	Flat	Mixed	Light	Temp	River Cross	9		No
Canal 2	Italy V	Oct-43	Brit	Ger	Div	Rgt	Rolling	Mixed	Light	Temp	River Cross	9		No
Capua	Italy V	Oct-43	Brit	Ger	Div	Div	Flat	Mixed	Dry	Temp	River Cross	2		No
Carroceto	Italy A	Feb-44	Ger	Brit	Div	Div	Flat	Mixed	Dry	Cold	Frontal Atk	8		No
Castel Volturno	Italy V	Oct-43	Brit	Ger	Div	Div	Flat	Mixed	Dry	Temp	River Cross	10		No
Castellonorato	Italy R	May-44	US	Ger	Div	Div	Rugged	Bare	Dry	Temp	Frontal Atk	5		No
Chan River	Korea	Apr-51	US	NKor	Div	Army			Light	Temp	Frontal Atk	24		No
Changkufeng 1	Manchuria	Jul-38	Jap	USSR	Rgt	Rgt	Rugged	Bare	Dry	Temp	Envelopment	3		No
Changkufeng 2	Manchuria	Aug-38	USSR	Jap	Div	Div	Rugged	Bare	Dry	Temp	Dbl Envelop	3		No
Changkufeng 3	Manchuria	Sep-38	USSR	Jap	Army	Div	Rugged	Bare	Dry	Temp	Dbl Envelop	6		No
Chartres	W.Europe	Aug-44	US	Ger	Div	Army	Rolling	Mixed	Dry	Temp	Envelopment	5		No
Chateau Salins	W.Europe	Nov-44	US	Ger	Corp	Div	Rolling	Mixed	Heavy	Cold	Frontal Atk	17		No
Chinese Farm 1	Sinai	Oct-73	Is	Egy	Div	Corp	Rolling	Desert	Dry	Hot	Envelopment	14	15	Atkr
Chinese Farm 2	Sinai	Oct-73	Is	Egy	Div	Corp	Rolling	Desert	Dry	Hot	Frontal Atk	11	19	No
Chinese Farm-W.	Sinai	Oct-73	Is	Egy	Div	Div	Rolling	Desert	Dry	Hot	Frontal Atk	11	11	No
Chouigui Pass	N.Africa	Nov-42	Ger	US	Bn	Co	Rolling	Bare	Dry	Temp	Frontal Atk	1		Dfdr
Ciechanov 1	E.Europe	Jan-45	USSR	Ger	Div	Div	Rolling	Bare	Light	Cold	Frontal Atk	2		No
Ciechanov 2	E.Europe	Jan-44	USSR	Ger	Div	Div	Rolling	Bare	Light	Cold	Frontal Atk	3		No
Cisterna	Italy R	May-44	US	Ger	Div	Div	Flat	Mixed	Light	Temp	Frontal Atk	8		Atkr
Cobra	W.Europe	Jul-44	US	Ger	Corp	Corp	Rolling	Mixed	Dry	Temp	Frontal Atk	11		No
Death to Invader	Sinai	Jul-48	Is	Egy	Rgt	Rgt	Rolling	Bare	Dry	Hot	Frontal Atk			No
Dragoni	Italy V	Oct-43	US	Ger	Div	Div	Rolling	Mixed	Light	Temp	Frontal Atk	5		No
Durstel-Faerbervle	W.Europe	Nov-44	US	Ger	Corp	Corp	Rolling	Mixed	Light	Cold	Frontal Atk	51		No

Identification							Environment				Tactics			
Battle			Nations		Echelon				Humi-	Temp	Attacker			Major
Name	Location	Date	Attr	Dfdr	Attr	Dfdr	Terrain	Cover	dity	ture	Maneuver	Wdth	Dpth	Suprs
East Prussia	E.Europe	Jan-45	USSR	Ger	ArGp	ArGp	Rolling	Mixed	Light	Cold	Dbl Envelop	500		No
Eboli	Italy S	Sep-43	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	8		No
El Arish	Sinai	Jun-67	Is	Egy	Div	Div	Flat	Desert	Dry	Hot	Frontal Atk	7	3	No
El Auja-Ayin	Sinai	Dec-48	Is	Egy	Div	Div	Flat	Bare	Dry	Temp	Frontal Atk	2		No
El Guettar 3	N.Africa	Mar-43	Ger	US	Div	Div	Rolling	Bare	Dry	Temp	Frontal Atk	25		Attr
Fioccia	Italy A	Feb-44	Ger	US	Div	Div	Flat	Mixed	Light	Temp	Frontal Atk	8		No
Formia	Italy R	May-44	US	Ger	Div	Div	Rugged	Bare	Dry	Temp	Frontal Atk	4		No
Fosso Campoleone	Italy R	May-44	US	Ger	Corp	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	11		No
Francolise	Italy V	Oct-43	Brit	Ger	Div	Rgt	Rolling	Mixed	Light	Temp	Frontal Atk	6		No
Gaza Strip	Sinai	Jun-67	Is	PLO	Div	Div	Flat	Mixed	Dry	Hot	Frontal Atk	9	6	No
Gaza-Khan Yunis	Sinai	Nov-56	Is	Egy	Rgt	Rgt	Flat	Urban	Dry	Hot	Frontal Atk	5		No
Golan Cntratk	Golan	Oct-73	Syr	Is	Div	Div	Rugged	Bare	Dry	Hot	Frontal Atk	25	24	No
Goodwood	W.Europe	Jul-44	Brit	Ger	Army	Corp	Rolling	Mixed	Dry	Temp	Frontal Atk	21		Attr
Grazzanise	Italy V	Oct-43	Brit	Ger	Div	Div	Flat	Mixed	Dry	Temp	River Cross	2		No
Guadalajara	Spain	Mar-37	Ital	SRpb	Army	Army	Flat	Bare	Heavy	Cold	Frontal Atk	11		Attr
Han River	Korea	Mar-51	US	NKor	Div	Army			Dry	Temp	River Cross	8		No
Hills 153-115	Pacific	Jun-45	US	Jap	Div	Rgt	Rugged	Mixed	Dry	Temp	Frontal Atk	3		No
Hill-95 1	Pacific	Jun-45	US	Jap	Div	Rgt	Rugged	Mixed	Dry	Temp	Frontal Atk	3		No
Hill-95 2	Pacific	Jun-45	US	Jap	Div	Rgt	Rugged	Mixed	Dry	Temp	Frontal Atk	2		No
Hiram	Golan	Oct-48	Is	Syr	Div	Rgt	Rolling	Bare	Dry	Hot	Frontal Atk	3		No
Hushniyah	Golan	Oct-73	Is	Syr	Div	Div	Rugged	Bare	Dry	Hot	Frontal Atk	12	9	No
Il Giogio Pass	Italy N	Sep-44	US	Ger	Div	Rgt	Rugged	Mixed	Light	Temp	Frontal Atk	4		No
Iron Triangle	Korea	Jun-51	NKor	US	Army	Div			Heavy	Temp	Frontal Atk	32		No
Ismailia	Sinai	Oct-73	Is	Egy	Div	Div	Rolling	Desert	Dry	Hot	Frontal Atk	20	11	No
Itri-Fondi	Italy R	May-44	US	Ger	Div	Div	Rugged	Mixed	Dry	Temp	Envelopment	6		No
Ivo Jima 1	Pacific	Feb-45	US	Jap	Corp	Div	Rolling	Bare	Dry	Temp	Frontal Atk	5		No
Ivo Jima 3	Pacific	Mar-45	US	Jap	Corp	Rgt	Rolling	Bare	Dry	Temp	Frontal Atk	2		No
Ivo Jima-Suribachi	Pacific	Feb-45	US	Jap	Rgt	Rgt	Rugged	Bare	Dry	Temp	Frontal Atk	1		No
Jebel Geneifa	Sinai	Oct-73	Is	Egy	Div	Corp	Rolling	Desert	Dry	Hot	Frontal Atk	18	11	No
Jebel Libni	Sinai	Jun-67	Is	Egy	Div	Div	Flat	Desert	Dry	Hot	Frontal Atk	10	7	No
Jenin	W.Bank	Jun-67	Is	Jor	Div	Rgt	Rugged	Mixed	Dry	Hot	Dbl Envelop	2	5	Attr
Jerusalem	W.Bank	Jun-67	Is	Jor	Corp	Rgt	Rugged	Mixed	Dry	Hot	Dbl Envelop	11	13	Attr
Jerusalem Cor'dor	W.Bank	Jul-48	Is	Jor	Div	Rgt	Rolling	Bare	Dry	Hot	Frontal Atk	5		No
Jerusalem Jebussi	W.Bank	Apr-48	Is	Jor	Rgt	Rgt	Rugged	Mixed	Dry	Temp	Frontal Atk	10		No
Jitra	Malaysia	Dec-41	Brit	Jap	Div	Div	Rolling	Wooded	Heavy	Hot	Frontal Atk	8		Attr
Kakazu-Tombstone	Pacific	Apr-45	US	Jap	Div	Rgt	Rolling	Mixed	Dry	Temp	Frontal Atk	4		No
Kansas Line	Korea	Apr-51	NKor	US	Army	Div			Light	Temp	Pursuit	24		No
Kantara Firdan	Sinai	Oct-73	Is	Egy	Div	Corp	Rolling	Desert	Dry	Hot	Frontal Atk	27	17	No
Katibiya	W.Bank	Jun-67	Is	Jor	Rgt	Rgt	Rugged	Mixed	Dry	Hot	Frontal Atk	1	6	No
Kerama	Jordan	Mar-68	Is	Jor	Div	Div	Flat	Mixed	Dry	Temp	Frontal Atk	5		No
Kfar Shams-Antar	Golan	Oct-73	Is	Irq	Div	Div	Rugged	Bare	Dry	Hot	Envelopment	20	7	Attr
Kochi Cntratk	Pacific	May-45	Jap	US	Div	Rgt	Rugged	Mixed	Dry	Temp	Frontal Atk	2		No
Kochi Ridge 4	Pacific	May-45	US	Jap	Div	Div	Rugged	Mixed	Light	Temp	Frontal Atk	2		No
Kochi-Onaga 1	Pacific	Apr-45	US	Jap	Div	Rgt	Rugged	Mixed	Light	Temp	Dbl Envelop	3		No
Kochi-Onaga 2	Pacific	Apr-45	US	Jap	Div	Rgt	Rugged	Mixed	Dry	Temp	Envelopment	3		No
Kochi-Onaga 3	Pacific	Apr-45	US	Jap	Div	Rgt	Rugged	Mixed	Light	Temp	Dbl Envelop	3		No
Korsun-Shevkovsky	E.Europe	Jan-44	USSR	Ger	ArGp	Army	Flat	Mixed	Heavy	Cold	Dbl Envelop	180		No
Kuneitra	Golan	Jun-67	Is	Syr	Div	Div	Rugged	Mixed	Dry	Hot			7	No
Kuneitra 2	Golan	Oct-73	Syr	Is	Div	Rgt	Rugged	Bare	Dry	Hot	Frontal Atk	15	12	Attr
Kunson	Korea	Sep-50	US	NKor	Div	Army			Dry	Temp	Pursuit	73		No
Kursk Cntratk	E.Europe	Aug-43	USSR	Ger	ArGp	Army	Rolling	Mixed	Dry	Temp	Frontal Atk	250		No
Kursk-Belgorod	E.Europe	Sep-43	USSR	Ger	Army	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	16		No
Kursk-Oboyan 1	E.Europe	Jul-43	Ger	USSR	Corp	Army	Rolling	Mixed	Dry	Temp	Frontal Atk	16		No
Kursk-Oboyan 2	E.Europe	Jul-43	Ger	USSR	Corp	Army	Rolling	Mixed	Dry	Temp	Frontal Atk	20		No
Kursk-Oboyan 3	E.Europe	Jul-43	Ger	USSR	Corp	Army	Rolling	Mixed	Dry	Temp	Frontal Atk	25		No
Kursk-Prothorovka	E.Europe	Jul-43	USSR	Ger	ArGp	Corp	Rolling	Mixed	Dry	Temp	Frontal Atk	25		No
Kursk-South	E.Europe	Jul-43	Ger	USSR	Army	ArGp	Rolling	Mixed	Light	Temp	Frontal Atk	30		No
Lamuvio	Italy R	May-44	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	3		No
Lariano	Italy R	Jun-44	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	5		No
Leningrad-"Spark"	E.Europe	Jan-43	USSR	Ger	Army	Army	Flat	Mixed	Light	Cold	Frontal Atk	13		No
Lvov-Sandomierz	E.Europe	Jul-44	USSR	Ger	ArGp	ArGp	Flat	Mixed	Dry	Temp	Envelopment	440		No
Maeda Escarpment	Pacific	Apr-45	US	Jap	Div	Div	Rolling	Mixed	Heavy	Temp	Frontal Atk	2		No
Melitopol	E.Europe	Jan-44	USSR	Ger	ArGp	Army	Rolling	Mixed	Dry	Temp	River Cross	111		No
Melun	W.Europe	Aug-44	US	Ger	Div	Div	Rolling	Mixed	Light	Temp	River Cross	5		No
Metz	W.Europe	Sep-44	US	Ger	Corp	Army	Rolling	Mixed	Light	Temp	Frontal Atk	25		No
Mishmarhayarden 1	Golan	Jun-48	Syr	Is	Rgt	Rgt	Flat	Mixed	Dry	Hot	Frontal Atk	5		No
Mishmarhayarden 2	Golan	Jul-48	Syr	Is	Rgt	Rgt	Flat	Mixed	Dry	Hot	Frontal Atk	6		No
Mitla Pass	Sinai	Jun-67	Egy	Is	Div	Div	Flat	Desert	Dry	Hot	Frontal Atk	1	10	No
Moletta River 1	Italy A	Feb-44	Ger	Brit	Div	Div	Flat	Mixed	Dry	Cold	River Cross	3		No
Moletta River 2	Italy A	Feb-44	Ger	Brit	Div	Div	Flat	Mixed	Dry	Cold	River Cross	4		Attr
Moletta River 3	Italy R	May-44	Brit	Ger	Div	Div	Flat	Mixed	Light	Temp	River Cross	9		No

Identification							Environment				Tactics			
Battle			Nations		Echelon									
Name	Location	Date	Attk	Dfdr	Attk	Dfdr	Terrain	Cover	Humidity	Temp	Attacker Maneuver	Wdth	Dpth	Major Suprs
Monte Acero	Italy V	Oct-43	US	Ger	Div	Div	Rugged	Mixed	Dry	Temp	Frontal Atk	8		No
Monte Camino 1	Italy V	Nov-43	Brit	Ger	Div	Rgt	Rugged	Mixed	Light	Temp	Frontal Atk	5		No
Monte Camino 2	Italy V	Nov-43	Ger	Brit	Rgt	Rgt	Rugged	Mixed	Light	Temp	Frontal Atk	1		No
Monte Camino 3	Italy V	Dec-43	Brit	Ger	Div	Rgt	Rugged	Mixed	Light	Temp	Frontal Atk	2		No
Monte Grande	Italy V	Oct-43	Brit	Ger	Rgt	Rgt	Rolling	Mixed	Light	Temp	Frontal Atk	9		No
Monte Grande	Italy R	May-44	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	9		No
Monte Lungo	Italy V	Nov-43	US	Ger	Div	Rgt	Rugged	Mixed	Light	Temp	Frontal Atk	6		No
Monte Maggiore	Italy V	Dec-43	US	Ger	Div	Rgt	Flat	Mixed	Heavy	Temp	Frontal Atk	1		No
Monte Rotondo	Italy V	Nov-43	US	Ger	Div	Rgt	Rugged	Mixed	Light	Temp	Frontal Atk	5		No
Morhange	W.Europe	Nov-44	US	Ger	Div	Div	Rolling	Mixed	Light	Cold	Frontal Atk	8		No
Morhange-Faulquemt	W.Europe	Nov-44	US	Ger	Corp	Corp	Rolling	Mixed	Light	Cold	Frontal Atk	49		No
Mortain	W.Europe	Aug-44	Ger	US	Corp	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	9		Attr
Moscow Cntratk	Russia	Dec-41	USSR	Ger	ArGp	ArGp	Rolling	Mixed	Snow	Cold	Dbl Envelop	1060		No
Moscow Defense	Russia	Sep-41	Ger	USSR	ArGp	ArGp	Rolling	Mixed	Snow	Cold	Frontal Atk	700		No
Moselle-Metz	W.Europe	Sep-44	US	Ger	Corp	Army	Rolling	Mixed	Light	Temp	River Cross	25		No
Mount Herman 3	Golan	Oct-73	Is	Syr	Rgt	Rgt	Rugged	Mixed	Dry	Hot	Frontal Atk	2	8	No
Mount Hermon 1	Golan	Oct-73	Is	Syr	Rgt	Rgt	Rugged	Bare	Dry	Hot	Frontal Atk	1	2	No
Mount Hermon 2	Golan	Oct-73	Is	Syr	Rgt	Rgt	Rugged	Mixed	Dry	Hot	Frontal Atk	1	4	No
Mount Hermonit	Golan	Oct-73	Syr	Is	Div	Rgt	Rugged	Bare	Dry	Hot	Frontal Atk	8	21	No
Mutankiang	Manchuria	Aug-45	USSR	Jap	Army	Corp	Rugged	Mixed	Light	Temp	River Cross	12		Attr
Naba	Golan	Oct-73	Jor	Is	Div	Rgt	Rugged	Bare	Dry	Hot	Frontal Atk	9	8	No
Nablus	W.Bank	Jun-67	Is	Jor	Div	Div	Rugged	Mixed	Dry	Hot	Frontal Atk	3	5	No
Nafekh	Golan	Oct-73	Syr	Is	Div	Rgt	Rugged	Bare	Dry	Hot	Frontal Atk	7	8	Attr
Nakhl	Sinai	Jun-67	Is	Egy	Div	Div	Flat	Desert	Dry	Hot	Dbl Envelop	12	9	Attr
Nam River	Korea	Sep-50	US	NKor	Div	Army			Dry	Temp	Pursuit	52		No
Nikopol Bridgehead	E.Europe	Jan-44	USSR	Ger	Div	Div	Flat	Mixed	Heavy	Cold	River Cross	12		No
Nishibaru Ridge	Pacific	Apr-45	US	Jap	Div	Rgt	Rolling	Mixed	Dry	Temp	Frontal Atk	2		No
Nomonhan 1	Manchuria	May-39	Jap	USSR	Rgt	Rgt	Rolling	Bare	Dry	Temp	Envelopment	3		No
Nomonhan 2	Manchuria	Aug-39	USSR	Jap	Army	Army	Rolling	Bare	Dry	Temp	Dbl Envelop	50		Attr
Okinawa Beach 1	Pacific	Apr-45	US	Jap	Div	Rgt	Flat	Mixed	Dry	Temp	Frontal Atk	2		No
Okinawa Beach 2	Pacific	Apr-45	US	Jap	Div	Rgt	Rolling	Mixed	Dry	Temp	Frontal Atk	5		No
Okinawa Outposts	Pacific	Apr-45	US	Jap	Div	Rgt	Rugged	Mixed	Dry	Temp	Frontal Atk	2		No
Pierce Line	Korea	Apr-51	US	NKor	Div	Army			Light	Temp	Frontal Atk	24		No
Pogoreloye	Russia	Aug-42	USSR	Ger	Army	Army	Flat	Swamp	Snow	Temp	Envelopment	36		No
Port of Salerno	Italy S	Sep-43	Brit	Ger	Div	Rgt	Rolling	Mixed	Dry	Temp	Frontal Atk	6		No
Pozzilli	Italy V	Nov-43	US	Ger	Div	Div	Rugged	Mixed	Light	Temp	Frontal Atk	8		No
Pusan Breakout	Korea	Sep-50	US	NKor	Div	Corp			Dry	Temp	Pursuit	40		No
Pusan Perimeter	Korea	Sep-50	NKor	US	Corp	Div			Light	Temp	Frontal Atk	39		No
Quang Tri	Viet Nam	Mar-72	NVN	SVN	Corp	Div	Flat	Mixed	Dry	Temp	Frontal Atk	44		No
Rafah	Sinai	Jun-67	Is	Egy	Div	Div	Flat	Desert	Dry	Hot	Dbl Envelop	24	9	Attr
Rafah-El Arish	Sinai	Nov-56	Is	Egy	Div	Div	Flat	Bare	Dry	Hot	Frontal Atk	6		No
Rafid	Golan	Oct-73	Syr	Is	Div	Rgt	Rugged	Bare	Dry	Hot	Frontal Atk	14	13	Attr
Raviyeh	Golan	Jun-67	Is	Syr	Rgt	Rgt	Rugged	Mixed	Dry	Hot	Frontal Atk	5	2	No
Rovno	Russia	Jun-41	Ger	USSR	Army	ArGp	Rolling	Mixed	Dry	Temp	River Cross	65		Attr
Saint Lo	W.Europe	Jul-44	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	12		No
Saint Vith	W.Europe	Dec-44	Ger	US	Corp	Div	Rolling	Mixed	Light	Cold	Frontal Atk	12		No
San Martino	Italy R	May-44	US	Ger	Div	Div	Rugged	Bare	Dry	Temp	Frontal Atk	6		No
Sarre-Singling	W.Europe	Dec-44	US	Ger	Corp	Corp	Rolling	Mixed	Dry	Cold	Frontal Atk	32		No
Sarre-St. Avold	W.Europe	Nov-44	US	Ger	Corp	Corp	Rolling	Mixed	Dry	Cold	Frontal Atk	64		No
Sarre-Union	W.Europe	Dec-44	US	Ger	Div	Div	Rolling	Mixed	Dry	Cold	Frontal Atk	5		No
Sauer River	W.Europe	Dec-44	Ger	US	Div	Rgt	Rugged	Mixed	Heavy	Cold	River Cross	15		Attr
Schmidt	W.Europe	Nov-44	US	Ger	Div	Corp	Rolling	Mixed	Light	Temp	River Cross	10		No
Sedan	W.Europe	May-40	Ger	Fr	Corp	Army	Rolling	Mixed	Dry	Temp	River Cross	9		Attr
Sedjanne-Bizerte	N.Africa	Apr-43	US	Ger	Div	Div	Rugged	Mixed	Dry	Temp	Frontal Atk	32		No
Seelow Heights	E.Europe	Apr-45	USSR	Ger	Div	Rgt	Rugged	Mixed	Dry	Temp	Frontal Atk	2		No
Seille-Nied	W.Europe	Nov-44	US	Ger	Corp	Corp	Rolling	Mixed	Heavy	Cold	River Cross	48		No
Seine River	W.Europe	Aug-44	US	Ger	Corp	Div	Rolling	Mixed	Light	Temp	River Cross	45		No
Sele-Calore	Italy S	Sep-43	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	11		No
Sevastopol	E.Europe	May-44	USSR	Ger	ArGp	Army	Rolling	Urban	Dry	Temp	Dbl Envelop	25		No
Sezze	Italy R	May-44	US	Ger	Div	Rgt	Rolling	Mixed	Dry	Temp	Frontal Atk	14		No
Shallufa 1	Sinai	Oct-73	Is	Egy	Div	Corp	Rolling	Desert	Dry	Hot	Frontal Atk	32	11	No
Shallufa 2	Sinai	Oct-73	Is	Egy	Div	Corp	Rolling	Desert	Dry	Hot	Envelopment	32	8	No
Shuri Advance	Pacific	Apr-45	US	Jap	Div	Rgt	Rolling	Mixed	Dry	Temp	Frontal Atk	4		No
Shuri Cntratk	Pacific	May-45	Jap	US	Div	Div	Rolling	Mixed	Light	Temp	Frontal Atk	4		Attr
Shuri East 1	Pacific	May-45	US	Jap	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	2		No
Shuri East 2	Pacific	May-45	US	Jap	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	3		No
Shuri East 3	Pacific	May-45	US	Jap	Div	Div	Rolling	Mixed	Light	Temp	Envelopment	3		No
Shuri West 1	Pacific	May-45	US	Jap	Div	Rgt	Rugged	Mixed	Heavy	Temp	Envelopment	4		Attr
Shuri West 2	Pacific	May-45	US	Jap	Div	Div	Rugged	Mixed	Heavy	Temp	Frontal Atk	4		No
Shuri West 3	Pacific	May-45	US	Jap	Div	Div	Rugged	Mixed	Heavy	Temp	Frontal Atk	4		No
Singling-Bining	W.Europe	Dec-44	US	Ger	Div	Div	Rolling	Mixed	Light	Cold	Frontal Atk	4		No

Identification							Environment				Tactics			
Battle			Nations		Echelon						Attacker			
Name	Location	Date	Atkr	Dfdr	Atkr	Dfdr	Terrain	Cover	Humidity	Temperature	Maneuver	Wdth	Dpth	Major Suprs
Skyline Ridge	Pacific	Apr-45	US	Jap	Div	Rgt	Rugged	Mixed	Dry	Temp	Frontal Atk	3		No
Spigno	Italy R	May-44	US	Ger	Div	Div	Rugged	Bare	Dry	Temp	Frontal Atk	6		No
Suez Attack-N.	Sinai	Oct-73	Egy	Is	Corp	Corp	Rolling	Desert	Dry	Hot	Frontal Atk	50	54	No
Suez Attack-S.	Sinai	Oct-73	Egy	Is	Corp	Corp	Rolling	Desert	Dry	Hot	Frontal Atk	50	39	No
Suez Buildup-N.	Sinai	Oct-73	Egy	Is	Corp	Div	Rolling	Desert	Dry	Hot	Frontal Atk	110	43	No
Suez Buildup-S.	Sinai	Oct-73	Egy	Is	Corp	Div	Rolling	Desert	Dry	Hot	Frontal Atk	54	30	No
Suez Canal-N.	Sinai	Oct-73	Egy	Is	Corp	Div	Rolling	Desert	Dry	Hot	Frontal Atk	110	20	Atkr
Suez Canal-S.	Sinai	Oct-73	Egy	Is	Corp	Rgt	Rolling	Desert	Dry	Hot	Frontal Atk	38	15	Atkr
Suez [City]	Sinai	Oct-73	Is	Egy	Div	Corp	Rolling	Desert	Dry	Hot	Frontal Atk	6	10	No
Suomussalmi	Finland	Dec-39	Finn	USSR	Div	Corp	Rolling	Wooded	Snow	Cold	Dbl Envelop	32		Atkr
S. Maria Infante	Italy R	May-44	US	Ger	Div	Div	Rugged	Bare	Dry	Temp	Frontal Atk	8		No
S. Maria Oliveto	Italy V	Nov-43	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	5		No
Tarawa-Betio	Pacific	Nov-43	US	Jap	Div	Rgt	Rolling	Mixed	Dry	Temp	Frontal Atk	1		No
Targul Frumos	E.Europe	May-44	USSR	Ger	Army	Div	Flat	Bare	Light	Temp	Frontal Atk	19		No
Tarto-Tiber	Italy R	May-44	Brit	Ger	Corp	Div	Flat	Mixed	Dry	Temp	Frontal Atk	7		No
Tel el Hara	Golan	Oct-73	Irq	Is	Div	Div	Rugged	Bare	Dry	Hot	Frontal Atk	12	8	Dfdr
Tel Fahar-Banias	Golan	Jun-67	Is	Syr	Rgt	Rgt	Rugged	Mixed	Dry	Hot	Frontal Atk	7	2	No
Tel Faris	Golan	Oct-73	Is	Syr	Div	Div	Rugged	Bare	Dry	Hot	Frontal Atk	14	12	No
Tel Shaar	Golan	Oct-73	Is	Syr	Div	Div	Rugged	Bare	Dry	Hot	Frontal Atk	3	10	No
Tel Shams	Golan	Oct-73	Is	Syr	Div	Div	Rugged	Bare	Dry	Hot	Frontal Atk	5	11	No
Terracina	Italy R	May-44	US	Ger	Div	Div	Rugged	Mixed	Dry	Temp	Envelopment	15		No
Tiflit-Zababiya	W.Bank	Jun-67	Is	Jor	Rgt	Rgt	Rugged	Mixed	Dry	Hot	Frontal Atk	1	2	No
Tobacco Factory	Italy S	Sep-43	Ger	Brit	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	10		No
Tobacco Factory 1	Italy A	Jan-44	Ger	Brit	Div	Div	Rolling	Mixed	Dry	Cold	Frontal Atk	7		No
Tobacco Factory 2	Italy A	Feb-44	US	Ger	Div	Div	Flat	Mixed	Light	Temp	Frontal Atk	2		No
Tomb Hill-Ouki	Pacific	Apr-45	US	Jap	Div	Rgt	Rugged	Mixed	Heavy	Temp	Frontal Atk	3		No
Triflisco	Italy V	Oct-43	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	River Cross	9		No
Valmontone	Italy R	Jun-44	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	6		No
Velletri	Italy R	May-44	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	14		Dfdr
Via Anziate	Italy R	Jun-44	US	Ger	Div	Div	Rolling	Bare	Dry	Temp	Frontal Atk	4		No
Vietri 1	Italy S	Sep-43	Ger	Brit	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	15		No
Vietri 2	Italy S	Sep-43	Ger	Brit	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	15		No
Villa Crocetta	Italy R	May-44	US	Ger	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	5		No
Vistula Crossing 1	E.Europe	Jul-44	USSR	Ger	Corp	Div	Flat	Mixed	Dry	Temp	River Cross	10		No
Vistula Crossing 2	E.Europe	Aug-44	USSR	Ger	Corp	Corp	Flat	Mixed	Dry	Temp	Frontal Atk	12		No
Vistula-Oder	E.Europe	Jan-45	USSR	Ger	ArGp	ArGp	Flat	Mixed	Dry	Cold	Dbl Envelop	480		No
Westwall	W.Europe	Oct-44	US	Ger	Corp	Corp	Rolling	Mixed	Light	Temp	River Cross	13		No
Yaeju Dake	Pacific	Jun-45	US	Jap	Div	Rgt	Rugged	Mixed	Dry	Temp	Frontal Atk	2		No
Yassy-Kishinev	E.Europe	Aug-44	USSR	Ger	ArGp	ArGp	Flat	Mixed	Dry	Temp	Dbl Envelop	590		No
Yehuda el Al	Golan	Oct-73	Syr	Is	Div	Div	Rugged	Bare	Dry	Hot	Frontal Atk	13	14	Atkr
Yuza Dake Advance	Pacific	Jun-45	US	Jap	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	3		No
Yuza Dake Attack	Pacific	Jun-45	US	Jap	Div	Div	Rolling	Mixed	Dry	Temp	Frontal Atk	3		No
Yuza Dake Capture	Pacific	Jun-45	US	Jap	Div	Rgt	Rolling	Mixed	Dry	Temp	Frontal Atk	3		No
Zaoura-Kala	Golan	Jun-67	Is	Syr	Rgt	Rgt	Rugged	Mixed	Dry	Hot	Frontal Atk	1	3	No

Name	Defender Posture	Wdth	Dpth	Duration Days	Hrs	Casualties Atkr	Dfdr	Tank-Loss Atkr	Dfdr	Movement	Resolution Attacker	Defender	Men	Rifle Sqds
Abu Ageila-Umkatef	Fortified	6		3		318	3,000	16	15				4,700	
Abu Ageila-Umkatef	Fortified	8	8	1	9	300	900	19	40	20	Breakthru	Withdraval*	19,280	40
Acre	Prepared	2		2		10	10	0	0				2,500	
Adabiya	Fortified	13	10	1		75	400	6	29	40	Penetration	Withdraval	10,900	10
Ageila-Rafah-Ayin	Prepared	2		10		400	600						4,000	
Ahmadiyeh	Fortified	8	4	2	23	700	250	96	30	1	Repulse	Stalemate	22,750	
Alam Halfa	Fortified	90		3	35	2,940	1,750	50	67	12	Repulse	Stalemate	124,000	
Alamein 2	Fortified	61		13		13,000	16,000	500	591	26	Breakthru	Withdraval*	220,476	
Alamein-Bridgehead	Fortified	61		7		3,000	4,500	38	180	7	Penetration	Stalemate	214,336	
Alamein-Lightfoot	Fortified	61		3		6,140	3,695	302	127	6	Penetration	Stalemate	220,476	
Alamein-Supercharg	Fortified	61		3		4,420	7,800	160	284	15	Breakthru	Withdraval*	211,000	
Amphitheater	Hasty	13		3		1,154	100	0		4	Penetration	Stalemate	12,917	243
Anzio Breakout	Fortified	6		3	41	710	1,355	93	51	14	Penetration	Withdraval	22,374	243
Anzio-Albano Road	Fortified	6		2		194	107			0	Repulse	Stalemate	17,343	
Aprilia 1	Hasty	7		2		1,158	130	7	4	5	Penetration	Withdraval	19,350	243
Aprilia 2	Prepared	2		1	13	270	311			1	Penetration	Withdraval	27,518	
Ardea	Fortified	9		3		245	374		0	6	Penetration	Withdraval	15,557	243
Ardennes		96		12				980	2060		Breakthru	Withdraval		
Arracourt	Hasty	10		4	21	779	119	87	25	-3	Repulse	Penetration	7,500	
Arras	Hasty	5		2			410	61	22		Repulse	Pursuit	11,821	81
Baerendorf 1	Hasty	4		2		58	224	4	4	1	Penetration	Withdraval	7,935	
Baerendorf 2	Prepared	11		1	7	56	233	4		5	Penetration	Stalemate	15,871	
Banias-Masada	Prepared		4	1		50	500	35	15	7			11,400	20
Bastogne	Hasty	12		3		3,000	1,151	50	103	15	Penetration	Withdraval	36,678	
Battipaglia 1	Hasty	5		4		1,112	1,639			2	Repulse	Stalemate	14,730	
Battipaglia 2	Delay	12		2		300	110			2	Penetration	Withdraval	14,730	243
Bayonette Line	Prepared	32		2		240	3,160		0	2	Penetration		13,700	243
Bekka Valley	Prepared	26		3	42	1,082	4,150	30	400	36	Penetration	Withdraval	34,500	
Berezina River	Hasty	10		5		670	4,795	35	15	160	Breakthru	Withdraval*	16,100	
Bir Gifgafa	Hasty	5	2	1	3	450	60	20	3	0	Withdraval	Pursuit	3,500	
Bir Hama-Gifgafa	Delay	10	6	1	3	75	550	5	30	25	Penetration	Withdraval	10,200	
Bir Lahfan	Hasty	10	5	1	14	90	1,350	11	30	15	Breakthru	Withdraval*	10,450	
Bir Rud Salim	Fortified			2		13	300	2	12				2,668	
Birhassna-Thamada	Prepared	7	5	1	9	60	550	10	30	28	Breakthru	Withdraval*	8,700	
Boos	Prepared	1		1				7	1	0	Bypass	Stalemate	189	
Bourgaltroff	Prepared	11		2	1[illegible]	185	141		8	2	Penetration	Withdraval	10,348	
Boutmiya	Prepared		8	1		50	500	35	30	21			17,550	50
Bowling Alley 1	Fortified	10		4	49	2,238	1,018	56	38	3	Penetration	Stalemate	41,974	
Brody 1	Prepared	6		1	17	980	720	14	0	8	Penetration	Withdraval*	39,000	
Brody 2	Prepared	7		1	18	1,750	490	34	41	7	Penetration	Withdraval*	38,500	
Burbach-Durstel	Prepared	11		3		110	216	10		4	Penetration	Withdraval	16,232	
Butte Line	Hasty	19		5		300	15,810		0	3	Penetration	Withdraval	29,000	243
Caiazzo	Delay	9		2	24	140	52			3	Penetration	Withdraval	18,210	243
Calabritto	Fortified	2		2	24	250	20			1	Penetration	Stalemate	17,765	243
Cambrai		2		5				72	161	48	Penetration	Withdraval	17,000	
Campoleone 1	Prepared	11		3	30	742	221			7	Penetration	Stalemate	17,766	243
Campoleone 2	Prepared	11		2	30	1,318	1,450			4	Penetration	Withdraval	26,029	
Campoleone Station	Fortified	7		3		517	580			3	Repulse	Stalemate	19,047	
Canal 1	Prepared	9		2		125	45			1	Penetration	Withdraval	14,600	
Canal 2	Prepared	9		3		220	138			3	Penetration	Withdraval	17,500	243
Capua	Prepared	2		1		420	94			0	Repulse	Stalemate	16,857	243
Carroceto	Prepared	8		2	20	341	369			3	Penetration	Stalemate	26,490	
Castel Volturno	Prepared	10		2		500	40			2	Penetration	Withdraval	21,265	243
Castellonorato	Fortified	5		2	21	537	442			4	Penetration	Withdraval	16,458	243
Chan River	Hasty	24		3		150	1,560		0	19	Penetration	Withdraval	26,000	243
Changkufeng 1	Fortified	3		1	6	178	350	0	17	1	Penetration	Withdraval*	1,410	
Changkufeng 2	Fortified	3		2	13	400	41	15	0	0	Repulse	Withdraval	4,000	
Changkufeng 3	Fortified	6		5		4,000	1,100	50	0	1	Repulse	Stalemate	20,000	
Chartres	Hasty	5		1		113	579			6	Penetration	Stalemate	15,646	
Chateau Salins	Fortified	17		2		720	446	8	3	4	Penetration	Withdraval	43,587	
Chinese Farm 1	Hasty	14	21	2	19	100	500	56	62	7	Penetration	Stalemate	22,790	26
Chinese Farm 2	Hasty	11	25	2	18	950	2,400	40	222	10	Penetration	Withdraval	28,900	20
Chinese Farm-W.	Hasty	11	12	1	13	300	800	15	64	5	Penetration	Withdraval	19,600	0
Chouigui Pass	Hasty	2		1	1	27	21	9	7	0	Repulse	Pursuit	465	
Ciechanov 1	Fortified	2		1		685	145	31	4	4	Penetration	Stalemate	10,800	
Ciechanov 2	Fortified	3		1		850	230	39	12	4	Penetration	Withdraval	12,115	
Cisterna	Fortified	8		3	40	1,524	1,617	15		14	Penetration	Withdraval	19,971	243
Cobra	Fortified	11		3		1,510	5,000			11	Breakthru	Withdraval	126,000	
Death to Invader	Prepared			5		250	300	0	8				2,500	
Dragoni	Delay	5		3		65	103			6	Penetration	Withdraval	17,034	243
Durstel-Faerbervle	Prepared	51		2		482	811	20		2	Penetration	Stalemate	90,078	

Name	Defender Posture	Defender Wdth	Defender Dpth	Duration Days	Duration Hrs	Casualties Atkr	Casualties Dfdr	Tank-Loss Atkr	Tank-Loss Dfdr	Movement	Resolution Attacker	Resolution Defender	Men	Rifle Sqds
East Prussia	Fortified	500		19		112,000	126,000	1060	480	126	Breakthru	Withdrawal	1,220,000	
Eboli	Delay	8		2		386	120			2	Penetration	Withdrawal	15,576	243
El Arish	Prepared	7	6	1	11	135	225	13	40	8	Breakthru	Withdrawal	6,350	
El Auja-Ayin	Prepared	2		3		350	600					Delay	6,000	
El Guettar 3	Hasty	25		1	5	450	203	42	31	0	Repulse	Withdrawal	10,300	
Fioccia	Fortified	8		3		265	403			0	Repulse		15,367	
Formia	Delay	4		3		405	721			9	Penetration	Withdrawal	23,190	243
Fosso Campoleone	Fortified	11		3		1,304	1,379	80		3	Repulse	Stalemate	29,711	
Francolise	Prepared	6		3		75	44			5	Penetration	Stalemate	14,000	
Gaza Strip	Prepared	9	8	3	29	55	626	8	90	16	Breakthru	Surrender	12,150	20
Gaza-Khan Yunis	Prepared	5		1	20	121	1,987	2	0	30			4,000	
Golan Cntratk	Prepared	25	11	1	11	550	160	67	10	0	Repulse	Stalemate	35,750	60
Goodwood	Fortified	21		3	30	4,011	5,000	493	200	10	Penetration	Stalemate	76,213	
Grazzanise	Prepared	2		3		370	80			4	Penetration	Withdrawal	14,557	
Guadalajara	Prepared	11		5		6,460	6,660	15	21	2	Repulse	Pursuit	52,000	
Han River	Prepared	8		3		250	6,120		0	13	Penetration	Delay	25,500	243
Hills 153-115	Fortified	3		3		317	1,971	0	0	1	Penetration	Anihilation	15,808	243
Hill-95 1	Fortified	3		3		193	1,222	0	0	2	Penetration	Stalemate	16,091	243
Hill-95 2	Fortified	2		3		248	1,470	0	0	1	Penetration	Withdrawal*	16,002	243
Hiram	Prepared	3		3		650	2,100						6,000	
Hushniyah	Hasty	12	10	3	31	450	1,125	24	99	5	Penetration	Withdrawal	12,733	
Il Giogio Pass	Fortified	4		5		560	560		0	4	Penetration	Withdrawal	15,721	243
Iron Triangle	Hasty	32		2		1,460	150	0		1	Repulse	Stalemate	37,000	
Ismailia	Hasty	20	16	4	50	600	1,800	40	92	17	Repulse	Stalemate	17,000	20
Itri-Fondi	Delay	6		3		257	380			2	Penetration	Withdrawal	17,912	243
Iwo Jima 1	Fortified	5		5		6,845	15,615	11	40	6	Breakthru	Anihilation	33,915	
Iwo Jima 3	Fortified	2		6		3,885	2,685	0	40	1	Breakthru	Anihilation	32,000	
Iwo Jima-Suribachi	Fortified	1		5		510	1,231	0	0	1	Breakthru	Anihilation	3,200	81
Jebel Geneifa	Hasty	18	24	3	34	300	1,650	30	114	120	Penetration	Withdrawal	16,200	66
Jebel Libni	Prepared	10	5	1	4	70	450	10	32	5	Penetration	Withdrawal	10,800	
Jenin	Prepared	2	3	1	12	225	200	18	15	5	Penetration	Withdrawal	10,900	30
Jerusalem	Fortified	11	6	3	28	1,750	1,500	40	35	21	Breakthru	Withdrawal*	27,682	84
Jerusalem Cor'dor	Prepared	5		5		150	250	5	7				4,500	
Jerusalem Jebussi	Prepared	10		10		375	500	10	0				3,000	
Jitra	Hasty	8		1	15	600	1,200		0	11	Breakthru	Withdrawal	7,000	243
Kakazu-Tombstone	Fortified	4		4		1,079	2,468	0	0	0	Repulse	Stalemate	21,247	243
Kansas Line	Delay	24		5		5730	470	0		50	Penetration	Delay	30,700	
Kantara Firdan	Hasty	27	45	1	11	700	700	78	27	0	Repulse	Stalemate	25,850	0
Katibiya	Hasty	5	5	2	16	375	350	18		16	Breakthru	Withdrawal	12,800	10
Kerama	Prepared	5		1	16	201	497	20	33	0	Withdrawal	Stalemate	11,940	
Kfar Shams-Antar	Hasty	20	8	1	3	100	200	6	34	5	Penetration	Stalemate	11,000	0
Kochi Cntratk	Hasty	2		2		3,704	339	0	0	0	Repulse	Stalemate	6,850	
Kochi Ridge 4	Fortified	2		2		114	1,464	0	0	1	Penetration	Withdrawal*	15,109	243
Kochi-Onaga 1	Fortified	3		3		269	1,324	3	0	0	Repulse	Stalemate	14,594	243
Kochi-Onaga 2	Fortified	3		2		182	814	11	0	0	Repulse	Stalemate	15,986	243
Kochi-Onaga 3	Fortified	3		4		398	2,276	4	0	0	Repulse	Stalemate	15,764	243
Korsun-Shevkovsky	Prepared	180		25		63,500	68,000	360	229	145	Breakthru	Withdrawal*	254,950	
Kuneitra	Prepared		9	1		50	500	35	20	15			16,500	20
Kuneitra 2	Prepared	15	4	2		350	200	40	14	8	Breakthru	Stalemate	17,750	
Kunson	Delay	73		6		100	1,350		0	292	Penetration	Delay	16,200	243
Kursk Cntratk	Prepared	250		21		117,700	39,500	1340	340	147	Breakthru	Withdrawal	980,600	
Kursk-Belgorod	Fortified	16		3		11,676	2,405			26	Breakthru	Withdrawal	70,000	
Kursk-Oboyan 1	Fortified	16		3		1,364	5,680	42	45	13	Penetration	Withdrawal	62,000	
Kursk-Oboyan 2	Prepared	20		4		3,500	25,800	110	292	23	Penetration	Withdrawal	60,000	
Kursk-Oboyan 3	Prepared	25		5		2,900	30,200	85	139	3	Repulse	Stalemate	56,000	
Kursk-Prokhorovka	Hasty	25		2		5,700	5,100	380	200	0	Penetration	Stalemate	78,000	
Kursk-South	Prepared	30		1		3,180	4,900	134	88	8	Penetration	Withdrawal	140,000	
Lanuvio	Fortified	3		4		825	698			2	Repulse	Stalemate	17,300	243
Lariano	Prepared	5		2	27	329	1,178			4	Penetration	Withdrawal	22,641	243
Leningrad-"Spark"	Fortified	13		7		28,000	4,150		7	7	Breakthru	Withdrawal	120,000	
Lvov-Sandomierz	Prepared	440		17		37,400	198,000	1285	520	320	Breakthru	Withdrawal*	1,200,000	
Maeda Escarpment	Fortified	2		4		479	3,810	10	0	2	Penetration	Withdrawal	18,095	243
Melitopol	Fortified	111		41		79,000	36,500	460	170	320	Breakthru	Withdrawal	524,724	
Melun	Prepared	5		3		99	362	21		22	Penetration	Withdrawal	17,232	
Metz	Fortified	25		1		359	210			0	Repulse	Stalemate	60,794	
Mishmarhayarden 1	Prepared	5		5		250	2,500	5	0				4,000	
Mishmarhayarden 2	Hasty	6		6		250	270						3,000	
Mitla Pass	Hasty	1	3	1	11	550	90	100	16	0	Repulse	Pursuit	22,000	104
Moletta River 1	Prepared	3		3		167	107		0	3	Repulse	Stalemate	7,418	
Moletta River 2	Fortified	4		4		1,451	1,693			2	Penetration	Stalemate	21,478	
Moletta River 3	Fortified	9		2	19	234	468		0	0	Repulse	Stalemate	17,345	243

Name	Defender Posture	Wdth	Dpth	Duration Days	Hrs	Casualties Atkr	Dfdr	Tank-Loss Atkr	Dfdr	Movement	Resolution Attacker	Defender	Men	Rifle Sqds
Monte Acero	Delay	8		2		133	130			5	Penetration	Withdrawal	21,265	243
Monte Camino 1	Fortified	5		3		240	33			5	Repulse	Stalemate	19,513	243
Monte Camino 2	Hasty	1		3		34	310		0	1	Repulse	Withdrawal	7,942	
Monte Camino 3	Fortified	2		4		550	141			5	Penetration	Withdrawal	20,744	243
Monte Grande	Prepared	9		2		200	66			2	Penetration	Withdrawal	16,400	81
Monte Grande	Hasty	9		2		203	332			2	Penetration	Withdrawal	13,095	243
Monte Lungo	Fortified	6		2		361	142			3	Penetration	Stalemate	16,600	243
Monte Maggiore	Fortified	1		2	25	80	20	0		5	Penetration	Withdrawal	5,551	243
Monte Rotondo	Fortified	5		3		165	118			1	Penetration	Stalemate	16,350	243
Morhange	Prepared	8		3		1,006	197			7	Penetration	Withdrawal	25,881	
Morhange-Faulquemt	Fortified	49		4		3,223	2,665	38	63	7	Penetration	Withdrawal	92,393	
Mortain	Hasty	9		6		4,800	2,673	100		0	Repulse	Penetration	25,500	
Moscov Cntratk	Fortified	1060		34		139,000	85,300	290	510	143	Breakthru	Withdrawal	1,060,300	
Moscov Defense	Prepared	700		65		253,000	885,000	990	840	358	Penetration	Stalemate	1,100,000	
Moselle-Metz	Delay	25		6		1,647	1,700	19	30	32	Repulse	Stalemate	59,631	
Mount Herman 3	Fortified	2	3	1		100	250	0	0	5	Breakthru	Withdrawal	11,400	40
Mount Hermon 1	Fortified	1	1	1		50	100	1	2	0	Repulse	Stalemate	2,692	9
Mount Hermon 2	Fortified	1	3	1		150	200	0	0	0	Repulse	Stalemate	5,700	20
Mount Hermonit	Prepared	8	4	2	3	1,200	400	100	24		Repulse	Stalemate	31,650	82
Mutantiang	Fortified	12		8		10,000	36,000		84	160	Breakthru	Anihilation	147,000	
Naba	Prepared	9	7	1	5	450	100	57	8	0	Repulse	Stalemate	11,500	10
Nablus	Hasty	1	4	1	6	375	350	18	35	10	Breakthru	Withdrawal	10,700	
Nafekh	Hasty	7	5	2	17	500	250	69	10	0	Repulse	Pursuit	12,500	0
Nathi	Hasty	12	8	1	5	60	625	4	60	15	Breakthru	Withdrawal	18,780	40
Nam River	Delay	52		3		230	1,640		0	23	Penetration	Delay	16,400	243
Nikopol Bridgehead	Fortified	12		6		610	480	3	0	6	Breakthru	Withdrawal	25,100	
Nishibaru Ridge	Fortified	2		5		879	2,860	11	0	2	Penetration	Withdrawal*	17,163	243
Nomonhan 1	Hasty	5		2		278	250	10	0	7	Penetration	Withdrawal	1,300	
Nomonhan 2	Fortified	60		12		10,000	11,500			22	Breakthru	Withdrawal	57,000	
Okinava Beach 1	Delay	2		3		158	628	0	0	10	Penetration	Withdrawal*	22,888	243
Okinava Beach 2	Delay	5		3		282	1,588	5	0	7	Penetration	Withdrawal*	19,082	243
Okinava Outposts	Fortified	2		4		286	2,120	5	0	3	Penetration	Withdrawal*	18,398	243
Pierce Line	Hasty	24		4		170	4,780		0	15	Penetration	Stalemate	27,900	243
Pogoreloye	Prepared	36		8	117	21,300	6,530	260	110	54	Penetration	Withdrawal	54,180	
Port of Salerno	Hasty	6		3		1,530	120	0		4	Penetration	Stalemate	12,917	243
Pozzilli	Fortified	8		2		155	25	2		1	Repulse		17,404	243
Pusan Breakout	Delay	40		4		380	940		0	11	Penetration	Withdrawal	16,600	243
Pusan Perimeter	Hasty	39		2		110	430	0		2	Penetration	Stalemate	11,000	
Quang Tri	Prepared	44		30			14,300				Breakthru	Withdrawal*	30,000	
Rafah	Prepared	24	9	1	10	700	2,700	15	70	40	Breakthru	Withdrawal*	19,520	20
Rafah-El Arish	Fortified	15		1		229	3,433	5	20	26			10,000	
Rafid	Fortified	14	3	1	24	350	250	52	25	10	Breakthru	Withdrawal	19,525	55
Raviyeh	Fortified	5	3	1	4	150	300	30	20	6	Penetration	Withdrawal	5,350	
Rovno	Prepared	65		5		4,000	88,000	60	560	120	Breakthru	Withdrawal*	132,000	
Saint Lo	Fortified	12		8		2,777	2,350			8	Penetration	Withdrawal	18,228	243
Saint Vith	Hasty	12		6		4,306	1,731	66	56	30	Penetration	Withdrawal	87,000	
San Martino	Fortified	6		2	25	1,974	720			1	Repulse	Stalemate	17,970	243
Sarre-Singling	Delay	32		2		835	1,774	42		6	Penetration	Withdrawal	89,977	
Sarre-St. Avold	Prepared	64		8		2,279	4,942	67	54	22	Penetration	Withdrawal	88,941	
Sarre-Union	Prepared	5		2		234	129	3	2	3	Penetration	Withdrawal	19,773	
Sauer River	Hasty	15		2		268	134	2	3	6	Penetration	Stalemate	10,000	
Schmidt	Fortified	10		12		3,683	3,000	47		5	Repulse	Penetration	20,493	243
Sedan	Prepared	9		2		800	5,000		0	10	Breakthru	Withdrawal*	48,000	
Sedjanne-Bizerte	Fortified	32		11		1,120	605		5	44	Breakthru	Withdrawal	24,100	243
Seelow Heights	Fortified	2		2		474	150	54	3	3	Breakthru	Withdrawal	13,600	
Seille-Nied	Fortified	48		5		4,265	4,880	89	14	14	Penetration	Withdrawal	99,583	
Seine River	Prepared	45		3		234	906	21	3	38	Penetration	Withdrawal	40,619	
Sele-Calore	Hasty	11		1	14	251	60	1		4	Repulse	Stalemate	12,447	243
Sevastopol	Fortified	25		5		35,500	48,500	31	50	18	Breakthru	Anihilation	397,600	
Sezze	Withdrav	14		3		162	277			16	Penetration	Withdrawal	17,925	243
Shallufa 1	Hasty	32	16	2	14	150	1,100	15	35	10	Penetration	Withdrawal	16,200	0
Shallufa 2	Withdrav	32	15	2	27	150	1,100	8	68	20	Penetration	Withdrawal	11,700	20
Shuri Advance	Fortified	4		4		555	2,470	9	0	2	Penetration	Withdrawal*	18,388	243
Shuri Cntratk	Hasty	4		1		1,269	241	0	0	0	Repulse	Stalemate	4,000	
Shuri East 1	Fortified	2		3		502	4,038	6	0	1	Penetration	Stalemate	19,714	243
Shuri East 2	Fortified	3		5		590	4,328	4	0	1	Penetration	Stalemate	20,973	243
Shuri East 3	Fortified	3		2		313	3,022	3	0	1	Penetration	Stalemate	19,658	243
Shuri West 1	Prepared	4		2		170	478	0	0	1	Penetration	Withdrawal	16,043	243
Shuri West 2	Fortified	4		2		124	434	0	0	1	Repulse	Stalemate	15,840	243
Shuri West 3	Fortified	4		3		182	2,564	0	0	1	Penetration	Withdrawal*	15,205	243
Singling-Bining	Fortified	4		1	12	155	121	13	3	1	Repulse	Stalemate	15,224	

	Defender			Duration		Casualties		Tank-Loss		Move	Resolution		Rifle
Name	Posture	Wdth	Dpth	Days	Hrs	Attr	Dfdr	Attr	Dfdr	ment	Attacker	Defender	Men	Sqds
Skyline Ridge	Fortified	3		5		740	1,661	18	0	2	Penetration	Withdrawal*	16,291	243
Spigno	Delay	6		2	11	343	730			5	Penetration	Withdrawal	18,308	243
Suez Attact-N.	Hasty	50	29	1	9	1,700	380	120	31	0	Repulse	Stalemate	81,160	150
Suez Attact-S.	Hasty	50	19	1	9	1,350	260	140	17	0	Repulse	Stalemate	57,960	100
Suez Buildup-N.	Hasty	110	9	1	23	800	450	9	57	3	Penetration	Withdrawal	63,910	135
Suez Buildup-S.	Hasty	38	7	1	23	750	400	10	44	3	Penetration	Stalemate	45,160	90
Suez Canal-N.	Prepared	110	3	1	10	400	275	2	44	5	Penetration	Withdrawal	29,490	90
Suez Canal-S.	Prepared	38	3	1	10	350	225	20	42	5	Penetration	Stalemate	22,850	60
Suez (City)	Hasty	6	15	2	26	340	1,100	26	18	44	Repulse	Stalemate	14,681	13
Suomussalmi	Hasty	32		29		2,670	19,600	0	44	0	Breakthru	Anihilation	9,000	
S. Maria Infante	Fortified	8		3	25	531	1,035	9		3	Penetration	Withdrawal	18,702	243
S. Maria Oliveto	Prepared	5		2		416	185			3	Penetration	Withdrawal	16,870	243
Tarawa-Betto	Fortified	1		4	48	3,302	4,836	6	14	1	Breakthru	Anihilation	9,000	243
Targul Frumos	Mobile	19		1				350	11		Repulse	Stalemate	35,170	
Tarto-Tiber	Fortified	7		2		572	850		0	5	Penetration	Withdrawal	38,011	
Tel el Hara	Hasty	12	10	1	1	450	50	103	4	2	Repulse	Withdrawal	12,500	0
Tel Fahar-Banias	Fortified	7	4	1	13	300	850	5	20	5	Penetration	Withdrawal	5,375	
Tel Faris	Hasty	14	16	3		450	1,125	30	117	12	Penetration	Withdrawal*	17,833	17
Tel Shaar	Prepared	3	14	2	8	280	900	20	88	4	Penetration	Withdrawal	14,700	0
Tel Shams	Fortified	5	13	3	16	525	1,200	30	126	6	Penetration	Stalemate	16,100	10
Terracina	Hasty	15		2	24	287	380			5	Penetration	Withdrawal	18,030	243
Tiflit-Zababiya	Hasty	5	22	1	12	250	250	18	25	8	Penetration	Withdrawal	5,350	
Tobacco Factory	Hasty	10		2	11	702	317			4	Repulse	Stalemate	14,733	
Tobacco Factory 1	Hasty	7		1		366	62			0	Repulse		15,317	
Tobacco Factory 2	Fortified	2		2	15	101	206			0	Repulse		13,400	243
Tomb Hill-Ouki	Fortified	3		3		466	1,278	5	0	0	Penetration	Withdrawal*	18,111	243
Triflisco	Prepared	9		2	24	267	76			5	Penetration	Withdrawal	18,480	243
Valmontone	Hasty	6		2	31	710	568	7	8	5	Penetration	Withdrawal	26,607	243
Velletri	Fortified	14		1	7	767	1,319	18		2	Repulse	Stalemate	20,683	
Via Anziate	Fortified	4		2	30	316	884	8	12	1	Repulse	Stalemate	23,604	243
Vietri 1	Hasty	15		4		900	1,160			2	Repulse	Stalemate	15,000	
Vietri 2	Prepared	15		2		400	255			0	Repulse	Stalemate	13,300	
Villa Crocetta	Fortified	5		2		263	598			1	Repulse	Stalemate	18,000	243
Vistula Crossing 1	Prepared	12		3		1,150	320	0	4	4	Penetration	Withdrawal*	12,700	
Vistula Crossing 2	Prepared	12		6		3,040	785	27	18	2	Repulse	Stalemate	17,550	
Vistula-Oder	Prepared	480		23		46,900	147,400	1396	750	483	Breakthru	Withdrawal*	2,200,000	
Westwall	Fortified	13		6	65	1,477	3,616	79	49	8	Penetration	Withdrawal	32,283	
Yaeju Dake	Fortified	2		1		48	2,401	0	0	0	Penetration	Anihilation	5,237	243
Yassy-Kishinev	Prepared	590		10		135,000	690,000	335	380	325	Breakthru	Anihilation	1,250,000	
Yehuda el Al	Hasty	20	4	1	8	500	150	46	10	0	Repulse	Pursuit	21,984	50
Yuza Dake Advance	Prepared	3		4		112	798	0	0	2	Penetration	Stalemate	18,777	243
Yuza Dake Attack	Prepared	3		2		88	1,066	2	0	1	Penetration	Stalemate	18,660	243
Yuza Dake Capture	Prepared	3		6		576	3,220	4	0	2	Penetration	Anihilation	19,047	243
Zaoura-Kala	Fortified	1	4	1	9	230	500	55	25	8	Penetration	Withdrawal	5,850	

	Attacking Force							Defending Force							
	Mor-	AT		AD	Arty		Sor-		Rifle	Mor-	AT		AD	Arty		Sor-
Name	tars	Wpns	Tanks	Wpns	Guns	Ms	ties	Men	Sqds	tars	Wpns	Tanks	Wpns	Guns	Ms	ties
Abu Ageila-Umkatef	36	102	72	32	27	0	72	4,800		57	178	38	22	32		24
Abu Ageila-Umkatef	64	104	120	93	72	0	0	18,450	89	101	189	114	172	126		0
Acre	28	8	0	6	2	0	38	3,000		18	0	0	4	8	0	0
Adabiya	22	28	164	49	36	0	82	14,620	25	47	84	199	233	37	3	37
Ageila-Rafah-Ayin	36	24	50	4	16	0	900	3,000		27	12	67	6	12		
Ahmadiyeh	91	439	147	74	131	0	100	5,745		20	19	78	30	16	0	191
Afam Halfa			515		558	0		120,000				450		576	0	2,680
Alamein 2			1,037		908	0	11586	105,223				593		592	0	3,120
Alamein-Bridgehead			745		906	0		101,528				470			0	
Alamein-Lightfoot			1,037	61	908	0		105,223				593		592	0	
Alamein-Supercharg			700		906	0		97,000				310			0	
Amphitheater	218	470	0	54	138	66	131	4,250		8	23	128	17	56	0	115
Anzio Breakout		48	424	32	152	0	247	12,815		68	23	89	57	107	0	0
Anzio-Albano Road	262	535	36	84	100	0	35	11,343		65	18	19	10	96	0	0
Aprilia 1	262	523	71	72	180	62	0	6,750		38	15	46	52	66	0	28
Aprilia 2	226	88	113	184	223	0	0	17,730	243	80	429	100	47	226	62	121
Ardea	218	482	35	54	104	0	0	7,659		80	20	0	85	64	0	0
Ardennes			2,439			0						2,160			0	
Arracourt			126		12	0	0	4,800			12	122		48	0	130
Arras			88		8	0	0	18,000				218			0	
Baerendorf 1	192	22	106	42	51	0	0	5,366		18	9	30	74	64	0	0
Baerendorf 2	383	44	211	62	36	0	0	6,299		30	12	36	123	87	0	0
Banias-Hasaada	32	56	184	56	48	0	81	9,080	33	40	119	175	68	72	0	
Bastogne			359		313	0	0	4,849				152		18	0	0
Battipaglia 1	51	470	89	60	108	0	112	11,230	243	218	101	30	54	146	74	539
Battipaglia 2	244	583	97	60	152	74	94	6,995		244	35	58	54	80	0	31
Bayonette Line	108		118		72	0	60	35,500		290		0		72	0	0
Bekka Valley			775					25,000				362				
Berezina River			196		215	0		8,500				15		82	0	
Bir Gifgafa			60			0	0	3,600				70		0		
Bir Hama-Gifgafa			220	93	72	0	40	13,500	20	51	132	172		48		0
Bir Lahfan			180	50	48	0	76	10,050	28			180		48		20
Bir Rud Salim	24	47	40	11	5	0	24	3,300		15	51	68	18	24		8
Birhassna-Thamada			146	52	48	0	40	3,000	33	64	93	40		24		0
Boos			14		0	0	0	189		0	4	10	0		0	
Bourgaltroff			115		158	0	0	6,519				16		81	0	0
Boutmiya	80	120	224	85	72	0	81	16,767	60	72	212	366	123	108	0	
Bowling Alley 1	331	138	201	248	317	0	335	20,496	243		66	106	32	184	0	1,270
Brody 1			34		730	0	139	3,300				0		44	0	
Brody 2			55		718	0	3,288	12,900				103		103	0	
Burbach-Durstel	383	44	211	62	104	0	0	6,713		83	13	43	115	81	0	0
Butte Line	208		215		72	0	60	30,200		315		0		648	0	0
Caiazzo		66	106	32	104	0	8	6,435		48	32	42	25	51	0	27
Calabritto	218	470	51	54	130	0	26	7,588		61	13	12	13	37	0	0
Cambrai			218			0		12,143				238			0	
Campoleone 1	262	523	71	72	242	62	16	15,098		76	30	92	104	123	0	30
Campoleone 2	207	78	107	160	222	0	53	9,834	81	164	308	35	36	122	31	44
Campoleone Station		66	102	32	97	0	0	10,593		65	18	19	10	106	0	0
Canal 1	218	96	158	54	68	0	0	8,138		71	38	40	25	45	0	0
Canal 2	78	567	51	88	168	0	26	8,128		71	38	39	25	45	0	3
Capua	218	470	73	54	160	0	14	8,000		24	35	22	37	59	0	0
Carroceto	204	78	107	160	221	0	18	4,515	243	262	183	139	24	82	23	7
Castel Volturno	218	470	51	54	199	23	55	8,160		71	38	39	25	45	0	0
Castellonorato		70	124	32	154	0	40	7,500		32	17	21	5	73	0	0
Chan River	156		215		72	0	60	12,500		118		0		288	0	0
Changkufeng 1					14	0	0	1,460				20		20	0	0
Changkufeng 2			30		40	0	103	3,010				0		22	0	0
Changkufeng 3			200		100	0	407	8,000				0		37	0	0
Chartres	385	42	317	64	146	0	0	8,325		52		15	48	76	0	0
Chateau Salins	570		326	130	239	0	13	11,185		51		20	135	152	0	0
Chinese Farm 1	83	62	344	108	96	0	0	30,970	25	72	297	389	395	322	0	0
Chinese Farm 2	72	80	444	155	72	0	267	36,840	25	72	327	419	592	347	0	164
Chinese Farm-W.	36	30	232	75	72	0	153	18,180	17	421	66	293	554	119	0	80
Chouigui Pass			13		0	0	0	188				25	0	3	0	0
Ciechanov 1			73		420	0		3,100				12		78	0	
Ciechanov 2			190		414	0		3,900				32		84	0	
Cisterna		66	106	66	201	0	150	11,928		68	13	49	13	85	0	0
Cobra			650		792	0	800	30,700				62		318	0	0
Death to Invader	28	12	25	6	8	0		3,000		27	24	40	6	24		60
Dragoni		66	106	32	101	0	10	5,152		45	32	55	25	51	0	116
Durstel-Faerbervlei	246	303	624	311	543	0	0	30,712		179	26	75	221	456	0	0

	Attacking Force							Defending Force							
		AT		AD	--Arty--		Sor-		Rifle		AT		AD	--Arty--		Sor-
Name	Mor-tars	Wpns	Tanks	Wpns	Guns	Ms	ties	Men	Sqds	Mor-tars	Wpns	Tanks	Wpns	Guns	Ms	ties
East Prussia			2,035		15540	0		780,000				700		5,740	0	
Eboli		66	106	32	106	40	156	6,702		15	35	59	37	80	0	10
El Arish			90	32	48	0	38	12,750	63	71	137	78	126	36		0
El Auja-Ayin	54	24	75	6	24	0	206	4,000		36	16	90	8	16	0	
El Guettar 3			103		62	0	123	22,000	243			75		124	0	
Fioccia	163	78	45	69	164	0	170	19,613	243		66	106	32	187	0	178
Formia		82	225	32	159	0	0	7,627		32	19	30	10	58	0	0
Fosso Campoleone		93	281	64	146	17	35	15,801		93	27	100	72	117	0	11
Francolise	78	567	158	88	68	0	0	8,088		71	38	39	25	45	0	0
Gaza Strip	32	59	100	60	72	0	38	17,450		101	199	134		114		10
Gaza-Khan Yunis	32	95	25	16	12	0	8	6,400		90	34	8	32	44		
Golan Cntratk	94	329	566	111	198	0	50	16,100	10	34	31	270	78	60	0	50
Goodwood			1,369		720	0	4,000	57,500				528		292	0	
Grazzanise	78	567	158	88	68	0	0	8,068		71	38	39	25	45	0	0
Guadalajara			50		230	0	200	100,000				70			0	240
Han River	156		215		162	0	0	27,000		198		0		748	0	0
Hills 153-115			109		141	0	27	2,000				0		6	0	0
Hill-95 1			122		129	0	98	3,500				0		12	0	0
Hill-95 2	150		122		180	0	53	2,500		65		0		12	0	0
Hiram	112	36	60	24	32	0	96	6,000		54	24	60	12	24	0	12
Hushniyah	36	33	219	66	60	0	249	14,683		37	247	170	58	90	0	111
Il Giogio Pass	147	66	70	120	145	0	100	3,700		53	16	0	8	29	0	0
Iron Triangle	306		0		192	0	60	13,800	243	108		118		85	0	0
Ismailia	89	57	232	80	72	0	120	23,860	50	60	149	246	375	72	2	72
Itri-Fondi		70	104	32	126	0	8	6,650		34	14	26	15	40	0	32
Ivo Jima 1			144		474	0	300	18,300		65		40	100	59	0	10
Ivo Jima 3			144		800	0	175	2,685				40		120	0	0
Ivo Jima-Suribachi			23		330	0	40	1,600				0		30	0	10
Jebel Geneifa	36	30	318	75	48	0	240	35,623		123	196	454	468	150	4	150
Jebel Libni			184	75	48	0	53	3,000				60		48		0
Jenin	50	71	100	53	36	0	12	6,160	23	38	25	40	24	20		0
Jerusalem	136	190	91	122	72	0	11	13,600	50	82	69	40	52	36		4
Jerusalem Cor'dor	50	22	57	12	14	0	60	2,500		18	8	40	6	8	0	60
Jerusalem Jebussi	30	12	15	6	2	0		3,600		44	16	8	6	4	0	
Jitra			40		52	0	100	12,000				0		56	0	0
Katazu-Tombstone			0		246	0	166	3,000				0		32	0	0
Kansas Line	315		0		240	0		26,900	243	156		215		72	0	
Kantara Firdan	12	41	530	139	44	0	66	67,440	150	248	1,313	516	974	639	0	100
Katibiya	16	35	140	52	48	0	21	9,900	30	50	52	120	44	24		0
Kerama			128		67	0	156	16,168				60		91		0
Kfar Shams-Antar		21	212	57	40	0	30	12,000		5	153	269	50	70	0	20
Kochi Cntratk	261		0		60	0		15,350	81	100		140		198	0	175
Kochi Ridge 4	150		140		209	0	173	5,140		261		0		30	0	0
Kochi-Onaga 1			126		203	0	125	5,000				0		40	0	0
Kochi-Onaga 2			123		226	0	129	4,500				0		40	0	0
Kochi-Onaga 3			126		329	0	269	4,050				0		40	0	0
Korsun-Schevkovsky			451		2,650	0	15,290	84,500				229		828	0	
Kuneitra	32	63	409	79	72	0	81	19,300	60	72	230	505	115	132	0	
Kuneitra 2	69	335	75	68	115	0	49	3,630		12	9	50	19	12	0	107
Kunsan	162		215		72	0		7,100		48		0		23	0	
Kursk Cntratk			2,293		6,220	0		280,000				600		1,600	0	
Kursk-Belgorod			291		2,088	0		15,000				50		171	0	
Kursk-Oboyan 1			320		410	0		45,000				55		1,180	0	
Kursk-Oboyan 2			280		375	0		149,000				450		1,600	0	
Kursk-Oboyan 3			205		323	0		129,000				310		1,490	0	
Kursk-Prokhorovka			650		1,380	0		82,300				505		419	0	
Kursk-South			868		470	0	900	75,000				155		2,115	0	837
Lanuvio		51	0	32	94	0	371	6,108		30	10	46	43	61	0	11
Lariano			106		115	0	66	13,012				30		112	0	1
Leningrad-"Spark"			316		1,173	0	350	30,000				20		182	0	140
Lvov-Sandomierz			1,979		11265	0	30,365	900,000				900		4,800	0	
Maeda Escarpment			97		200	0	225	3,900				0		36	0	0
Melitopol			778		3,450	0		210,000				300		1,300	0	
Melun	387	42	318	64	146	0	46	6,000		36		16	20	32	0	0
Metz	757	180	472	192	296	0	30	39,580		220	20	88	208	248	0	0
Mishmarhayarden 1	28	12	100	6	2	0		2,500		36	16	0	8	16	0	
MishmarHayarden 2	30	12	60	6	6	0		2,700		27	12	25	6	16	0	
Mitla Pass	116	13	224	35	114	0	0	7,250			186	90	35	48	0	20
Moletta River 1	50	16	27	11	58	0	9	5,000	243		18	0	32	76	31	7
Moletta River 2	95	51	24	151	167	0	45	9,761	243		203	59	72	185	0	58
Moletta River 3	262	535	35	84	100	0	16	12,569		120	30	0	128	92	0	0

Attacking Force								Defending Force							
Name	Mortars	AT Wpns	Tanks	AD Wpns	Guns	Msl	Sorties	Men	Rifle Sqds	Mortars	AT Wpns	Tanks	AD Wpns	Guns	Msl	Sorties
Monte Acero		66	106	32	89	0		6,435		51	32	44	40	43	0	53
Monte Camino 1	218	470	45	54	160	0	90	6,750		48	18	38	25	41	0	14
Monte Camino 2	48	18	40	25	41	0	19	5,200	81	66	112	0	18	112	0	24
Monte Camino 3	218	470	0	54	140	0	156	3,288		25	8	12	13	34	0	0
Monte Grande	86	233	73	54	112	0	48	7,239		24	35	22	37	49	0	0
Monte Grande		61	130	32	132	0	6	4,563		20	11	23	9	40	0	0
Monte Lungo		66	106	32	110	0	238	6,566		41	32	54	25	50	0	48
Monte Maggiore		18	0		152	0	221	3,288		25	8	12	13	34	0	0
Monte Rotondo		66	106	32	106	0	132	7,942		50	17	42	25	53	0	58
Morhange	333	89	202	67	142	0	0	7,555		40	6	16	97	106	0	0
Morhange-Faulquemt	1,066	288	524		515	0	0	28,382		140	35	63		169	0	0
Mortain			120		218	0		27,673	243			340		192	0	100
Moscov Cntratk			667		3,440	0		880,000				850		2,050	0	
Moscov Defense			1,800		5,746	0		1,372,200				950		6,678	0	
Moselle-Metz		180	585	192	520	0	338	41,500		12	20	160	208	248	0	0
Mount Herman 3	72	67	0	59	24	0	60	4,750	16	22	79	0	16	27	0	30
Mount Hermon 1	16	16	9	14	12	0	33	1,583	5	7	28	5	7	24	0	15
Mount Hermon 2	36	34	0	29	12	0	30	4,750	16	22	79	0	16	27	0	30
Mount Hermonit	114	16	182	115	155	0	53	5,395	7	20	28	38	30	24	0	149
Mutankiang			770		1,786	0	800	75,000				105		584	0	120
Naba	22	113	269	29	48	0	50	11,000			21	212	57	48	0	50
Nablus			180	52	48	0	52	8,640	27	48		84	58	24		0
Nafekh	5	153	318	50	71	0	70	6,946	4	14	19	110	35	36	0	132
Nakhl	64	104	120	93	72	0	122	18,450	39	101	189	114		72		0
Nam River	140		200		70	0		9,000		77		0		28	0	
Nikopol Bridgehead			6		201	0		8,230				0		44	0	
Nishibaru Ridge			100		228	0	637	3,000				0		34	0	0
Nomonhan 1			10		4	0	40	1,228				0		14	0	
Nomonhan 2			498		216	0		30,000				120		135	0	
Okinava Beach 1	150		134		95	0	395	1,400		9		0				0
Okinava Beach 2			138		95	0	395	2,000				0		0	0	0
Okinava Outposts	150		134		173	0	158	2,900		0		0		32	0	0
Pierce Line	156		215		72	0	60	35,100		406		0		103	0	0
Pogoreloye			539		880	0		45,897				258		370	0	
Port of Salerno	218	470	0	54	138	66	131	4,250		8	23	38	13	46	0	115
Pozzilli		66	106	32	110	0	18	6,566		41	32	54	25	50	0	146
Pusan Breakout	140		200		70	0		10,300		57		0		72	0	
Pusan Perimeter	179		0		72	0	0	15,200	243	156		215		72	0	0
Quang Tri				16	100	0		17,000						78	0	
Rafah	32	65	240	91	84	0	38	19,520	95	107	105	197	142	68	0	51
Rafah-El Arish	63	156	108	44	32	0	34	10,050		135	421	108	57	130		
Rafid	76	370	147	68	129	0	63	4,958	4	16	13	75	19	24	0	120
Raviyeh			90	26	24	0	0	4,350			83	50	47	76		0
Rovno			765		370	0	1,200	150,000				852		320	0	450
Saint Lo			107		120	0	33	7,500				23		84	0	3
Saint Vith			251		94	0	0	19,996				152		108	0	0
San Martino	32	70	107	32	160	0	54	8,141			17	21	5	76	0	0
Sarre-Singling	1,279	303	624	268	565	0	19	31,501		181	12	42	438	193	0	0
Sarre-St. Avold	968	288	642	285	519	0	20	32,396		206	39	66	438	207	0	0
Sarre-Union	390	54	237	90	156	0	0	6,044		28	10	23	106	150	0	0
Sauer River	140	46	4	144	68	0	0	8,634	81	95	29	40	50	60	0	0
Schmidt			91		162	0		20,250				66		107	0	
Sedan			756		202	0	2,000	60,000				200		192	0	150
Sedjanne-Bizerte			94		100	0	75	5,000				5		34	0	
Seelow Heights			78		233	0	160	3,710				5		26	0	30
Seille-Nied			764		543	0	52	23,588				71		99	0	0
Seine River	607	123	472	144	296	0	73	15,000		90		38	50	80	0	0
Sele-Calore		48	106	32	82	28	18	8,390		15	45	78	25	90	0	7
Sevastopol			490		3,890	0		72,000				50		1,050	0	
Sezze		70	110	22	138	0	8	6,957		38	15	52	52	88	0	0
Shallufa 1	36	30	318	75	72	0	82	25,600	25	63	164	445	431	160	6	40
Shallufa 2	60	47	126	105	48	0	154	22,570	42	79	214	259	275	139	5	57
Shuri Advance			74		174	0	315	2,900				0		32	0	0
Shuri Cntratk			0		8	0	0	15,777	243			0		157	0	43
Shuri East 1			121		157	0	162	5,284				0		34	0	0
Shuri East 2			129		210	0	240	4,757				0		34	0	0
Shuri East 3			140		183	0	45	4,227				0		34	0	0
Shuri West 1			0		50	0	21	3,338				0		2	0	0
Shuri West 2			0		171	0	0	3,000				0		24	0	0
Shuri West 3	150		79		150	0	47	2,600		150		0		3	0	0
Singling-Bining	385	43	211	62	104	0	0	5,044		21	8	18	83	99	0	0

Name	Attacking Force: Mor-tars	AT Wpns	Tanks	AD Wpns	Arty-Guns	Arty-Ms	Sor-ties	Defending Force: Men	Rifle Sqds	Mor-tars	AT Wpns	Tanks	AD Wpns	Arty-Guns	Arty-Ms	Sor-ties
Skyline Ridge			125		221	0	526	2,600				0		38	0	0
Spigno		70	249	32	166	0	31	8,215		88	21	40	24	128	0	0
Suez Attack-N.	268	268	1,002	1,298	585	15	44	43,400	30		110	714	221	144	15	72
Suez Attack-S.	186	904	709	936	447	15	44	28,600	80	116	95	348	146	96	0	72
Suez Buildup-N.	229	231	464	1,547	639	15	100	14,000	10	30	38	192	84	40	0	67
Suez Buildup-S.	153	811	310	1,431	555	15	100	10,980	10	30	35	148	67	24	0	67
Suez Canal-N.	112	984	67	1,547	1,223	0	104	4,455	7	21	21	67	35	40	0	70
Suez Canal-S.	19	756	71	1,431	971	15	104	3,020	5	17	14	52	24	28	0	70
Suez [City]	48	43	225	68	60	0	154	22,570	42	79	214	259	375	139	4	57
Suomussalmi					8	0	0	29,954				55		96	0	0
S. Maria Infante	88	70	249	32	160	0	160	9,250			21	34	24	123	0	0
S. Maria Oliveto		72	106	32	92	0	83	6,321		61	14	30	12	41	0	48
Tarawa-Betto			46		278	0		4,836				14		53	0	0
Targul Frumos			410			0		13,725				160			0	
Tarto-Tiber	436	952	71	204	200	0	3	10,855		120	30	0	30	125	0	0
Tel el Hara		153	318	50	71	0	440	14,300		24	20	318	66	60	0	28
Tel Fahar-Banias	32	46	10	30	24	0	119	8,160		36	108	75	63	70		0
Tel Faris	46	31	249	87	60	0	250	23,750		71	325	253	91	150	0	111
Tel Shaar		21	318	72	60	0	220	21,500	25	40	323	387	84	130	0	80
Tel Shams	34	31	270	78	60	0	330	19,400	41	59	325	329	75	110	0	120
Terracina		70	131	32	148	0	6	6,653		34	14	26	15	40	0	0
Tiflit-Zababiya			90	26	24	0	21	5,450	15	25	31	60	28	24		0
Tobacco Factory	46	101	98	46	106	0	24	12,691	243		48	106		112	52	170
Tobacco Factory 1	76	30	92	104	130	0	50	17,976	243	262	523	71	72	242	62	33
Tobacco Factory 2		39	70	32	155	0	7	7,077			36	28	38	102	0	0
Tomb Hill-Ouki	150		151		221	0	123	4,731		77		0		32	0	0
Triflisco		66	106	66	113	0	33	7,250		24	35	22	35	59	0	10
Valmontone			126		146	0	121	10,111				31		110	0	0
Velletri		30	462	32	92	0	8	12,327		71	20	65	22	64	0	0
Via Anziate			156		121	0	38	19,255				35		202	0	2
Vietri 1	125	470	108	90	164	0	112	12,917	243	218	106	30	54	146	74	40
Vietri 2	125	81	108	68	164	0	31	18,912	243	244	501	96	90	152	74	33
Villa Crocetta		66	102	32	93	0	0	13,715		92	36	71	103	117	0	0
Vistula Crossing 1			0		205	0		5,100				12		78	0	
Vistula Crossing 2			34		308	0		6,400				24		156	0	
Vistula-Oder			4,230		17990	0		560,000				1,200		3,050	0	
Westwall			312		234	0		19,632				63		116	0	79
Yaeju Dake			40		53	0	0	2,500				0		6	0	0
Yassy-Kishinev			1,428		10469	0		800,000				400		5,320	0	
Yehuda el Al	71	381	189	90	129	0	70	6,300		6	15	106	35	136	0	132
Yuza Dake Advance			113		177	0	151	4,000				0		21	0	0
Yuza Dake Attack			117		172	0	0	4,250				0		11	0	0
Yuza Dake Capture			115		206	0	76	3,250				0		5	0	0
Zaoura-Kala			90	26	24	0	119	8,560			113	75	63	82		0

APPENDIX E

STATISTICAL CHARACTERISTICS OF HISTORICAL DATA

Table E-1. Amount of Data on Which Characteristics are Based

Combat characteristic	Posture		
	Attacker	Joint	Defender
Force ratio - men		256	
Force ratio - mortars		116	
Force ratio - guns		245	
Troop density	251		251
Weapons system density	48		37
Rifle squad density	115		57
Mortar density	122		142
Antitank weapon density	113		136
Tank density	234		201
Artillery density	245		240
Air defense density	140		133
Close air support density	168		91
Casualty rate	251		253
Casualty ratio		251	
Tank loss rate	164		131
Advance rate	241		
Hours of combat per day		89	

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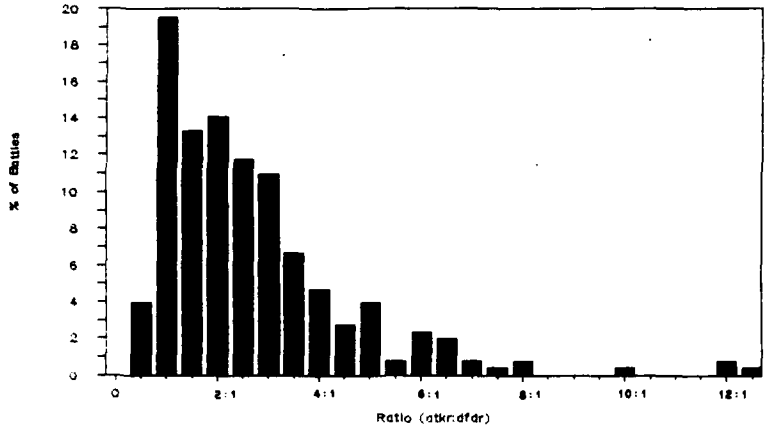
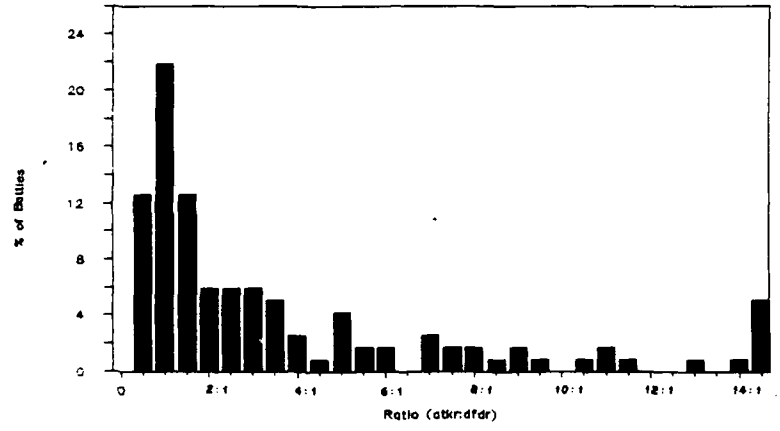
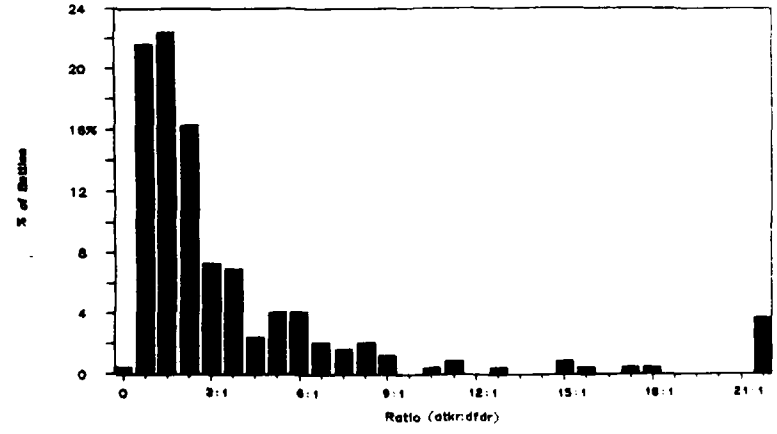
FORCE RATIO

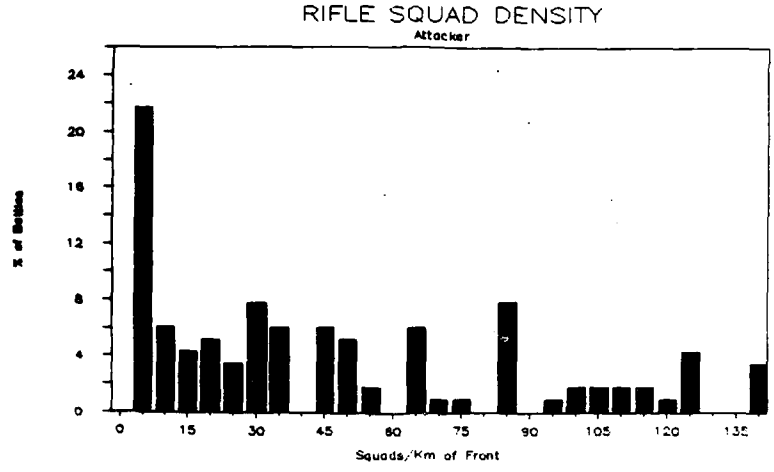


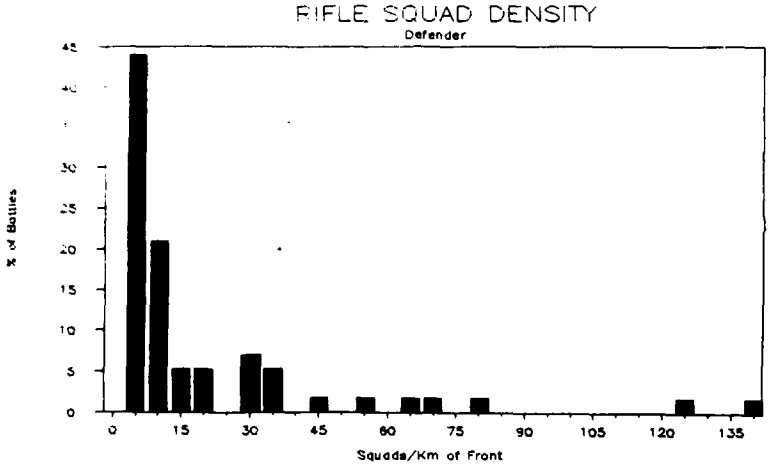
MORTAR RATIO

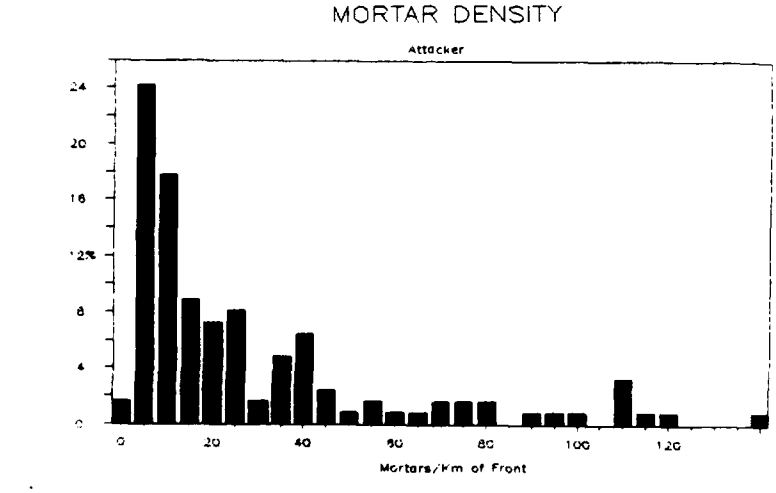


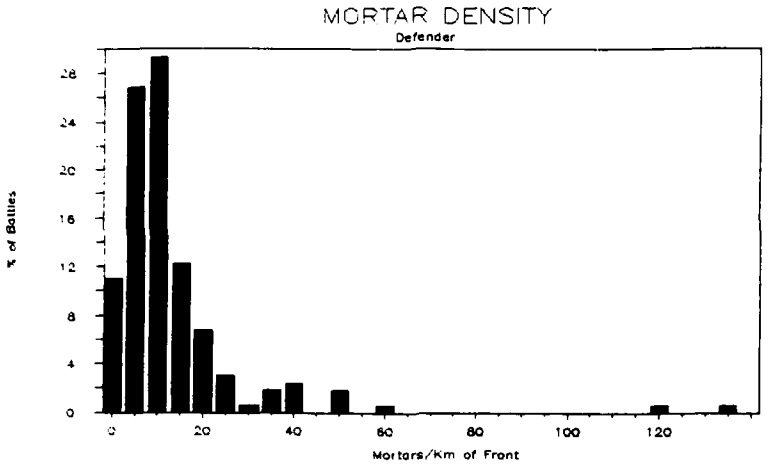
ARTILLERY RATIO

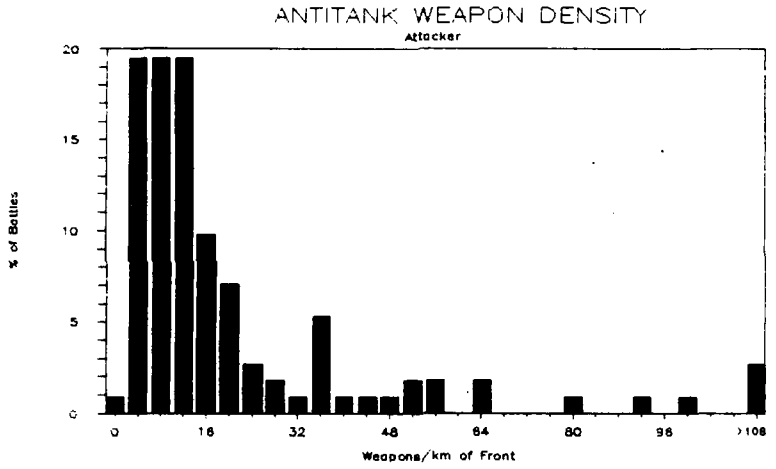


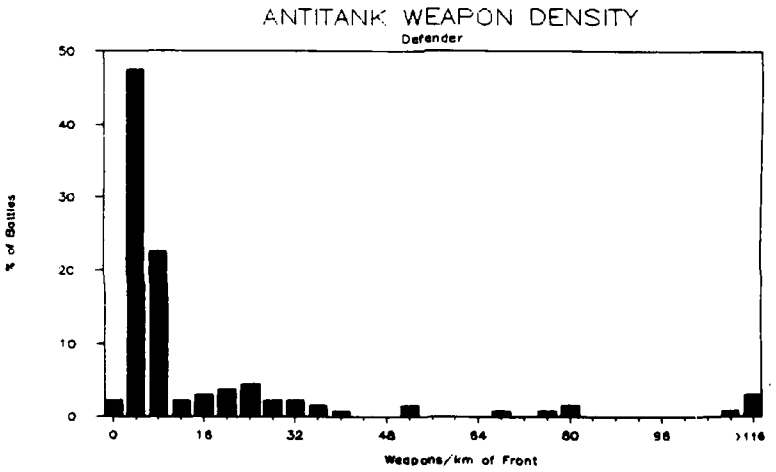

RIFLE SQUAD DENSITY
Attacker
% of Battles
24
20
16
12
8
4
0
0
15
30
45
60
75
90
105
120
135
Squads/Km of Front

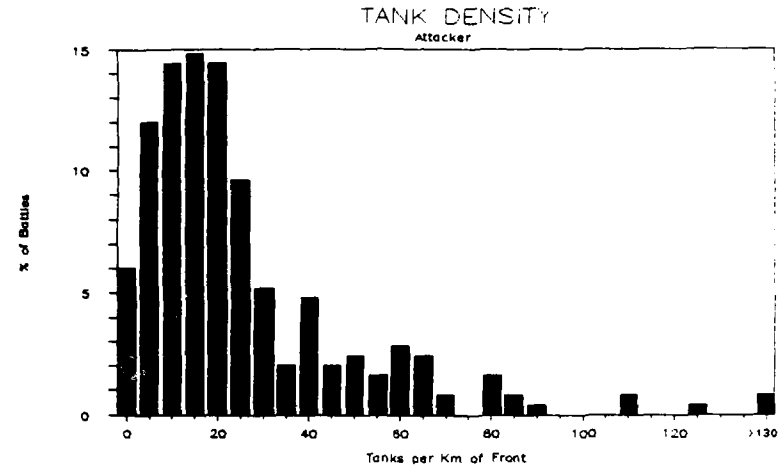

RIFLE SQUAD DENSITY
Defender
% of Battles
30
25
20
15
10
5
0
0
15
30
45
60
75
90
105
120
135
Squads/Km of Front

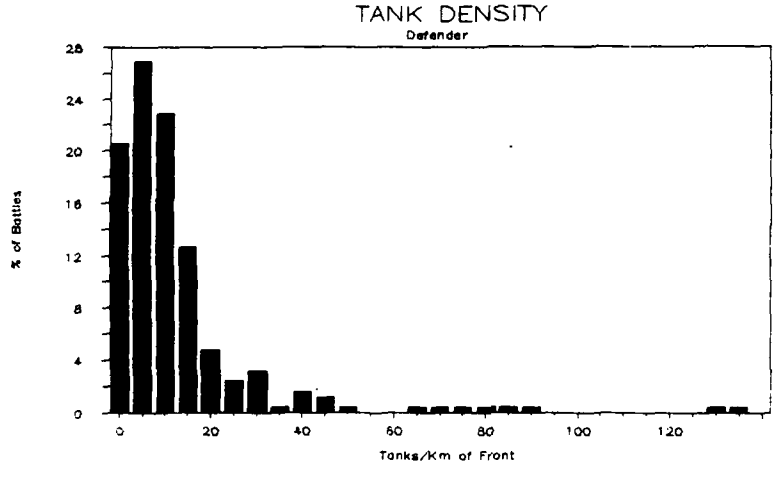

MORTAR DENSITY
Attacker
24
20
16
8
4
0
0
20
40
60
80
100
120
Mortars/Km of Front

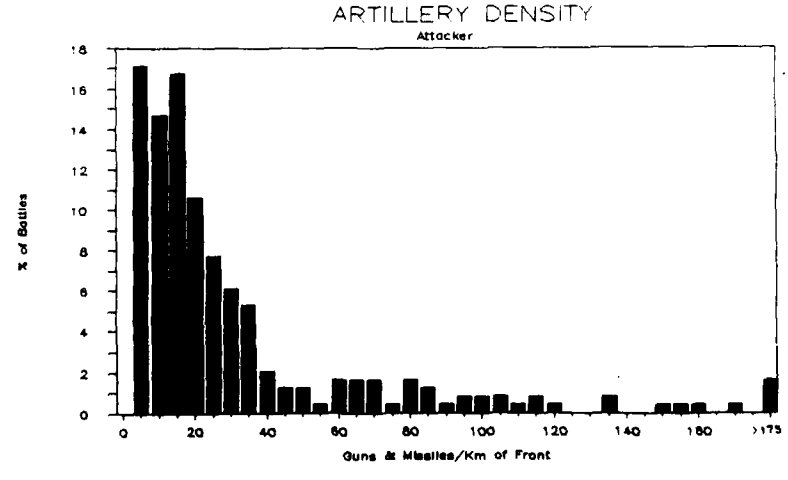

MORTAR DENSITY
Defender
% of Battles
0
4
8
12
16
20
24
28
0
20
40
60
80
100
120
Mortars/Km of Front


ANTITANK WEAPON DENSITY
Attacker
% of Battles
0
5
10
15
20
0
16
32
48
64
80
96
>108
Weapons/km of Front

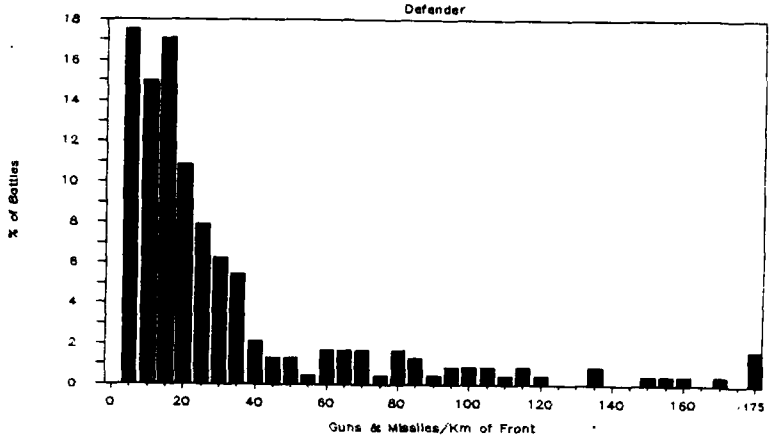

ANTITANK WEAPON DENSITY
Defender
% of Battles
0
10
20
30
40
50
0
16
32
48
64
80
96
>116
Weapons/km of Front


TANK DENSITY
Attacker
% of Battles
0
5
10
15
0
20
40
60
80
100
120
>130
Tanks per Km of Front

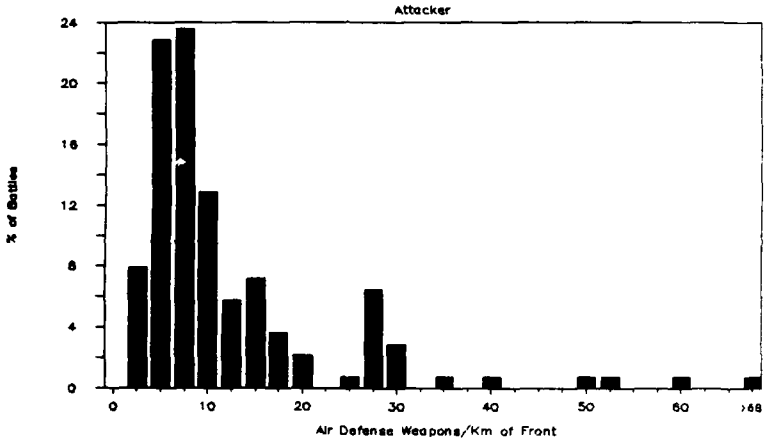

TANK DENSITY
Defender
% of Battles
0
4
8
12
16
20
24
28
0
20
40
60
80
100
120
Tanks/Km of Front


ARTILLERY DENSITY
Attacker
% of Battles
0
2
4
6
8
10
12
14
16
18
0
20
40
60
80
100
120
140
160
>175
Guns & Missiles/Km of Front

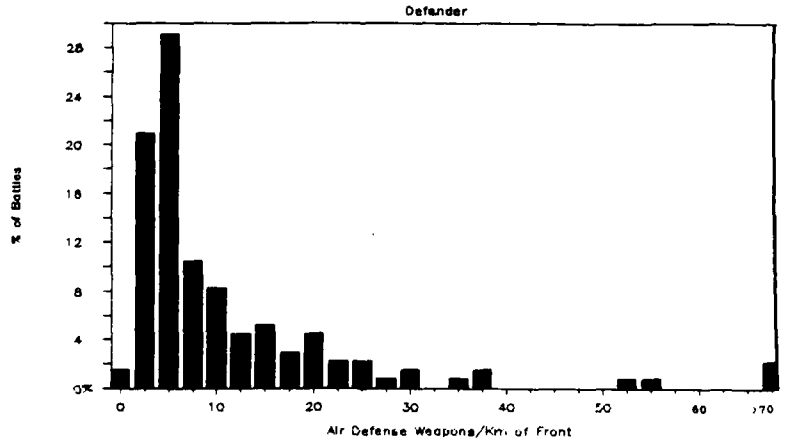
ARTILLERY DENSITY

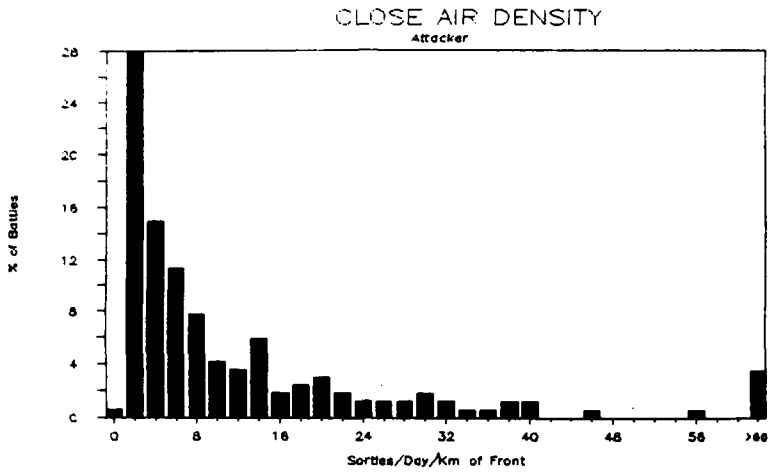


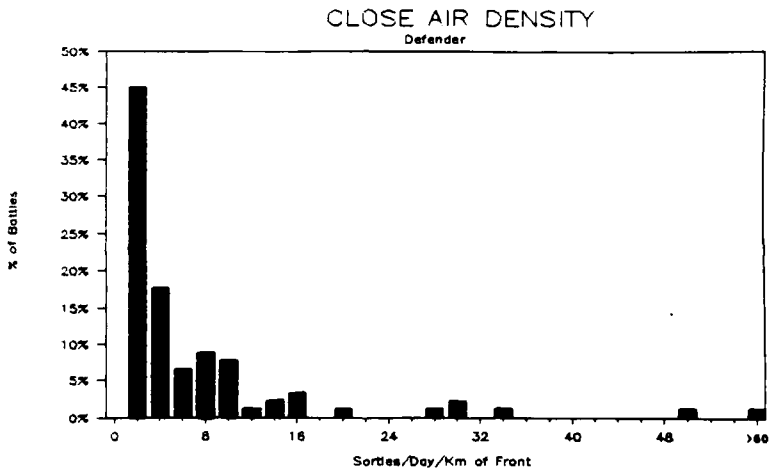
AIR DEFENSE WEAPON DENSITY

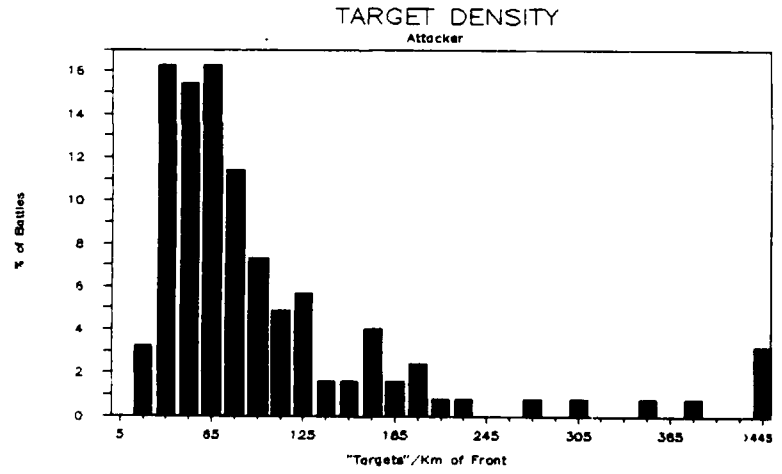


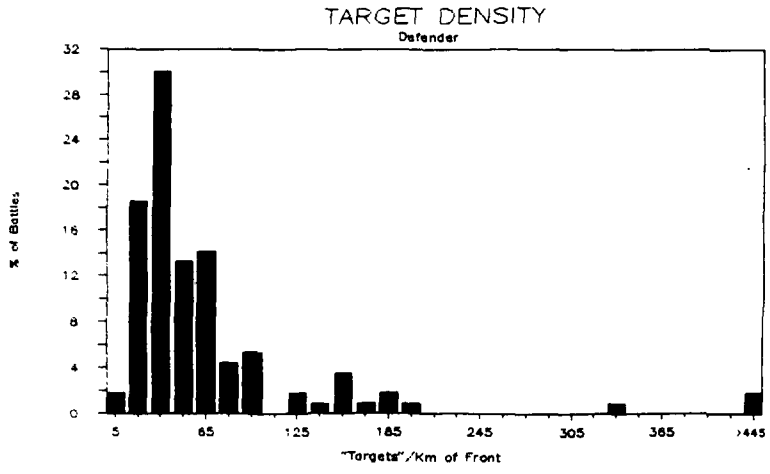
AIR DEFENSE WEAPON DENSITY

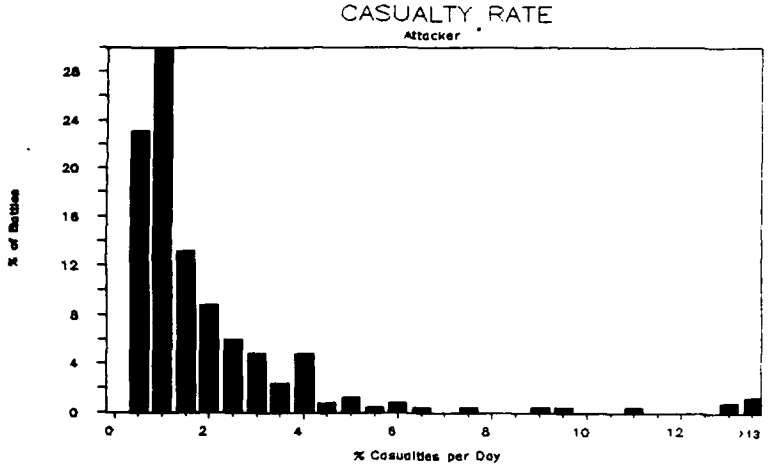


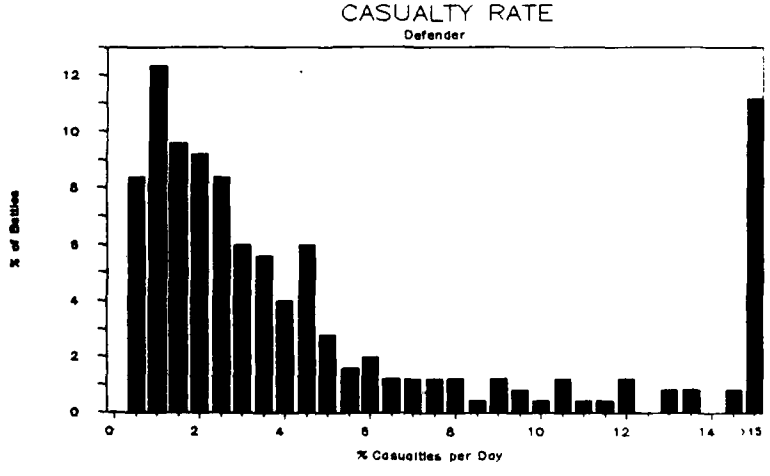

CLOSE AIR DENSITY
Attacker
% of Battles
28
24
20
16
12
8
4
0
0
8
16
24
32
40
48
56
>60
Sorties/Day/Km of Front

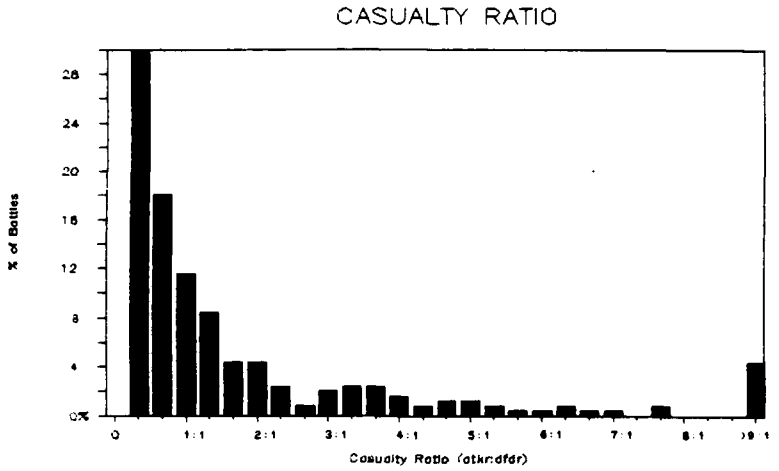

CLOSE AIR DENSITY
Defender
% of Battles
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
0
8
16
24
32
40
48
>60
Sorties/Day/Km of Front

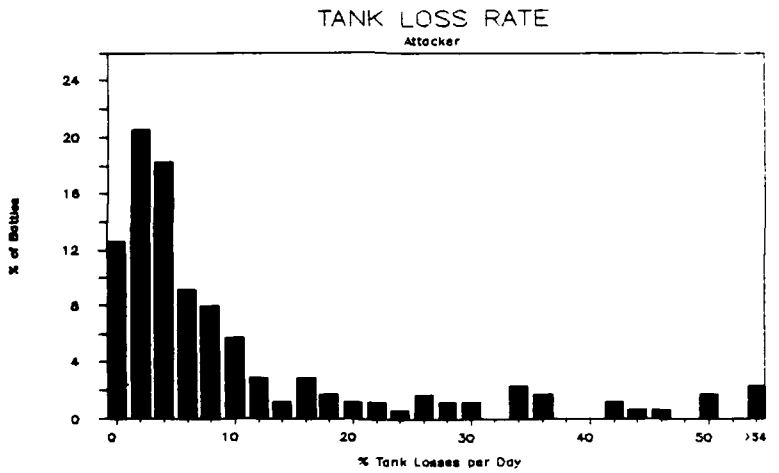

TARGET DENSITY
Attacker
% of Battles
16
14
12
10
8
6
4
2
0
5
65
125
185
245
305
365
>445
"Targets"/Km of Front

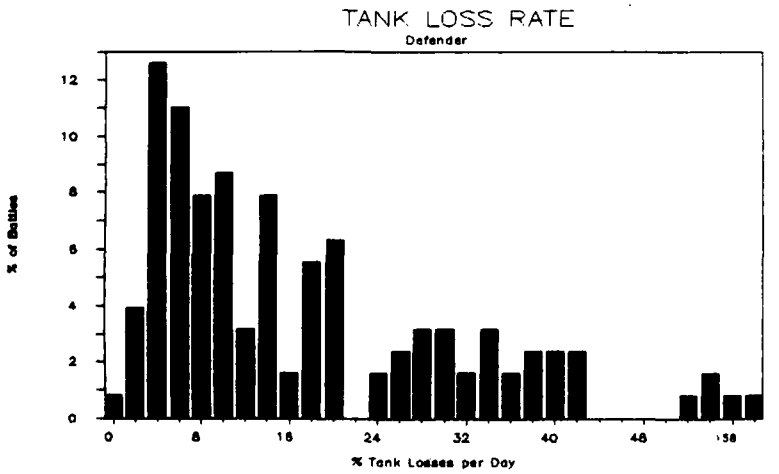

TARGET DENSITY
Defender
% of Battles
32
28
24
20
16
12
8
4
0
5
65
125
185
245
305
365
>445
"Targets"/Km of Front

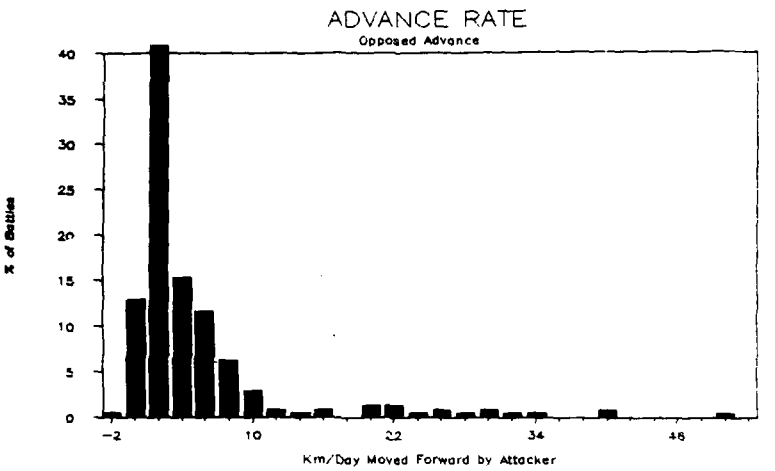

CASUALTY RATE
Attacker
% of Battles
28
24
20
16
12
8
4
0
0
2
4
6
8
10
12
>13
% Casualties per Day

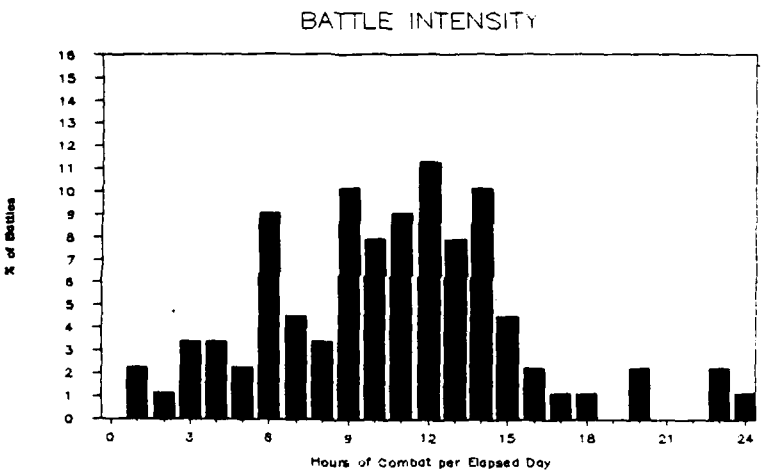

CASUALTY RATE
Defender
% of Battles
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
>15
% Casualties per Day


CASUALTY RATIO
% of Battles
28
24
20
16
12
8
4
0%
0
1:1
2:1
3:1
4:1
5:1
6:1
7:1
8:1
>9:1
Casualty Ratio (atkr:dfdr)


TANK LOSS RATE
Attacker
% of Battles
24
20
16
12
8
4
0
0
10
20
30
40
50
>54
% Tank Losses per Day


TANK LOSS RATE
Defender
% of Battles
12
10
8
6
4
2
0
0
8
16
24
32
40
48
>56
% Tank Losses per Day


ADVANCE RATE
Opposed Advance
% of Battles
40
35
30
25
20
15
10
5
0
-2
10
22
34
46
Km/Day Moved Forward by Attacker


BATTLE INTENSITY
% of Battles
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0
3
6
9
12
15
18
21
24
Hours of Combat per Elapsed Day

APPENDIX F

BLANK EVALUATION FORMS

The following pages contain blank forms. These may be reproduced to enable a user to apply the benchmarks to a particular wargame.

C R E D I B I L I T Y O F S I M U L A T E D C O M B A T

Run Date: _ _ _ _ _ _ _ _ Scenario:_ _ _ _ _ _ _ _ [X] Attacker

Model: _ _ _ _ _ _ _ _ Unit: _ _ _ _ _ _ _ [ ] Defender

Type of Test: [X] Centrality [ ] Plausibility

TYPE OF CRITERIA FROM MILITARY HISTORY			VALUES OF THE CRITERIA			RESULTS OF SIMULATED COMBAT	
Characteristic		Measure	Lower	Median	Upper	Value	Status
I N I T I A L C O N D I T I O N S							
RELATIVE ADVANTAGE	Troop	ratio(atk:def)	1.1:1	1.9:1	3.0:1	_ _ _	_ _ _ _
	Mortar	ratio(atk:def)	.67:1	1.6:1	4.6:1	_ _ _	_ _ _ _
	Gun & Missile	ratio(atk:def)	.87:1	1.7:1	3.7:1	_ _ _	_ _ _ _
TARGET DENSITY	Troop	men/meter	1.3	2.5	4.6	_ _ _	_ _ _ _
	Weapon System	"systems"/km	54	82	130	_ _ _	_ _ _ _
WEAPON DENSITY	Rifle Squad	squads/km	7.6	30	71	_ _ _	_ _ _ _
	Mortar	mortars/km	5.0	13	36	_ _ _	_ _ _ _
	Antitank	AT weapons/km	4.6	9.8	19	_ _ _	_ _ _ _
	Tank	tanks/km	9.7	18	31	_ _ _	_ _ _ _
	Artillery	guns & msls/km	7.6	16	31	_ _ _	_ _ _ _
	Air Defense	weapons/km	4.5	7.1	14	_ _ _	_ _ _ _
	Close Air	sorties/km/day	1.6	5.5	14	_ _ _	_ _ _ _
O U T C O M E S							
TROOP ATTRITION		% / day	.57	.93	2.0	_ _ _	_ _ _ _
CASUALTY RATIO		atkr:dfdr	.26:1	.68:1	1.8:1	_ _ _	_ _ _ _
TANK LOSSES		% / day	1.7	4.3	14	_ _ _	_ _ _ _
OPPOSED MOVEMENT		km / day	.4	1.7	5.0	_ _ _	_ _ _ _
COMBAT INTENSITY		hrs / day	7.3	10	13	_ _ _	_ _ _ _

CREDIBILITY OF SIMULATED COMBAT

Run Date: _ _ _ _ _ _ _ _ Scenario: _ _ _ _ _ _ _ _ [ ] Attacker

Model: _ _ _ _ _ _ _ _ Unit: _ _ _ _ _ _ _ [X] Defender

Type of Test: [X] Centrality [ ] Plausibility

TYPE OF CRITERIA FROM MILITARY HISTORY			VALUES OF THE CRITERIA			RESULTS OF SIMULATED COMBAT	
Characteristic		Measure	Lower	Median	Upper	Value	Status
INITIAL CONDITIONS							
RELATIVE ADVANTAGE	Troop	ratio(atk:def)	1.1:1	1.9:1	3.0:1	_ _ _	_ _ _ _
	Mortar	ratio(atk:def)	.67:1	1.6:1	4.6:1	_ _ _	_ _ _ _
	Gun & Missile	ratio(atk:def)	.87:1	1.7:1	3.7:1	_ _ _	_ _ _ _
TARGET DENSITY	Troop	men/meter	.72	1.3	1.9	_ _ _	_ _ _ _
	Weapon System	"systems"/km	30	71	150	_ _ _	_ _ _ _
WEAPON DENSITY	Rifle Squad	squads/km	1.9	6.7	21	_ _ _	_ _ _ _
	Mortar	mortars/km	3.2	7.2	13	_ _ _	_ _ _ _
	Antitank	AT weapons/km	2.2	4.2	13	_ _ _	_ _ _ _
	Tank	tanks/km	3.5	6.9	14	_ _ _	_ _ _ _
	Artillery	guns & msls/km	4.8	8.9	16	_ _ _	_ _ _ _
	Air Defense	weapons/km	2.9	5.0	12	_ _ _	_ _ _ _
	Close Air	sorties/km/day	1.0	2.6	7.5	_ _ _	_ _ _ _
OUTCOMES							
TROOP ATTRITION		% / day	1.2	2.8	5.7	_ _ _	_ _ _ _
CASUALTY RATIO		atkr:dfdr	.26:1	.68:1	1.8:1	_ _ _	_ _ _ _
TANK LOSSES		% / day	4.9	12	27	_ _ _	_ _ _ _
OPPOSED MOVEMENT		km / day	.40	1.7	5.0	_ _ _	_ _ _ _
COMBAT INTENSITY		hrs / day	7.3	10	13	_ _ _	_ _ _ _

C R E D I B I L I T Y O F S I M U L A T E D C O M B A T

Run Date: _ _ _ _ _ _ _ _ Scenario: _ _ _ _ _ _ _ _ [X] Attacker

Model: _ _ _ _ _ _ _ _ Unit: _ _ _ _ _ _ _ [ ] Defender

Type of Test: [ ] Centrality [X] Plausibility

TYPE OF CRITERIA FROM MILITARY HISTORY			VALUES OF THE CRITERIA			RESULTS OF SIMULATED COMBAT	
Characteristic		Measure	Lower	Median	Upper	Value	Status
I N I T I A L C O N D I T I O N S							
RELATIVE ADVANTAGE	Troop	ratio(atk:def)	.57:1	1.9:1	6.3:1	_ _ _	_ _ _ _
	Mortar	ratio(atk:def)	.21:1	1.6:1	13:1	_ _ _	_ _ _ _
	Gun & Missile	ratio(atk:def)	.24:1	1.7:1	15:1	_ _ _	_ _ _ _
TARGET DENSITY	Troop	men/meter	.45	2.5	9.3	_ _ _	_ _ _ _
	Weapon System	"systems"/km	24	82	600	_ _ _	_ _ _ _
WEAPON DENSITY	Rifle Squad	squads/km	1.1	30	120	_ _ _	_ _ _ _
	Mortar	mortars/km	.76	13	110	_ _ _	_ _ _ _
	Antitank	AT weapons/km	1.5	9.8	82	_ _ _	_ _ _ _
	Tank	tanks/km	2.9	18	80	_ _ _	_ _ _ _
	Artillery	guns & msls/km	1.7	16	110	_ _ _	_ _ _ _
	Air Defense	weapons/km	2.0	7.1	35	_ _ _	_ _ _ _
	Close Air	sorties/km/day	.31	5.5	43	_ _ _	_ _ _ _
O U T C O M E S							
TROOP ATTRITION		% / day	.2	.93	5.5	_ _ _	_ _ _ _
CASUALTY RATIO		atkr:dfdr	.08:1	.68:1	7.0:1	_ _ _	_ _ _ _
TANK LOSSES		% / day	0	4.3	44	_ _ _	_ _ _ _
OPPOSED MOVEMENT		km / day	0	1.7	21	_ _ _	_ _ _ _
COMBAT INTENSITY		hrs / day	3	10	19	_ _ _	_ _ _ _

C R E D I B I L I T Y O F S I M U L A T E D C O M B A T

Run Date: _ _ _ _ _ _ _ _ Scenario: _ _ _ _ _ _ _ _ [ ] Attacker

Model: _ _ _ _ _ _ _ _ Unit: _ _ _ _ _ _ _ [X] Defender

Type of Test: [ ] Centrality [X] Plausibility

TYPE OF CRITERIA FROM MILITARY HISTORY			VALUES OF THE CRITERIA			RESULTS OF SIMULATED COMBAT	
Characteristic		Measure	Lower	Median	Upper	Value	Status
I N I T I A L C O N D I T I O N S							
RELATIVE ADVANTAGE	Troop	ratio(atk:def)	.57:1	1.9:1	6.3:1	_ _ _	_ _ _ _
	Mortar	ratio(atk:def)	.21:1	1.6:1	13:1	_ _ _	_ _ _ _
	Gun & Missile	ratio(atk:def)	.24:1	1.7:1	15:1	_ _ _	_ _ _ _
TARGET DENSITY	Troop	men/meter	.30	1.3	5.7	_ _ _	_ _ _ _
	Weapon System	"systems"/km	3.7	71	610	_ _ _	_ _ _ _
WEAPON DENSITY	Rifle Squad	squads/km	.13	6.7	80	_ _ _	_ _ _ _
	Mortar	mortars/km	.63	7.2	38	_ _ _	_ _ _ _
	Antitank	AT weapons/km	.59	4.2	75	_ _ _	_ _ _ _
	Tank	tanks/km	1.3	6.9	45	_ _ _	_ _ _ _
	Artillery	guns & msls/km	1.5	8.9	50	_ _ _	_ _ _ _
	Air Defense	weapons/km	1.1	5.0	36	_ _ _	_ _ _ _
	Close Air	sorties/km/day	.2	2.6	29	_ _ _	_ _ _ _
O U T C O M E S							
TROOP ATTRITION		% / day	.3	2.8	22	_ _ _	_ _ _ _
CASUALTY RATIO		atkr:dfdr	.08:1	.38:1	7.0:1	_ _ _	_ _ _ _
TANK LOSSES		% / day	.5	12	53	_ _ _	_ _ _ _
OPPOSED MOVEMENT		km / day	0	1.7	21	_ _ _	_ _ _ _
COMBAT INTENSITY		hrs / day	3	10	19	_ _ _	_ _ _ _

COMPARISON OF SIMULATED BATTLES

Run Date: _ _ _ _ _ _ _ _ Type of Test: [ ] Centrality [ ] Plausibility

Model:_ _ _ _ _ _ _ _ _ Scenario:_ _ _ _ _ _ _ _ _

TYPE OF CRITERIA FROM MILITARY HISTORY			BATTLE _ _		BATTLE _ _		BATTLE _ _	
Characteristic		Measure	Atkr	Dfdr	Atkr	Dfdr	Atkr	Dfdr
		I N I T I A L C O N D I T I O N S						
RELATIVE ADVANTAGE	Men	ratio(atk:def)	_ _ _		_ _ _		_ _ _	
	Mortars	ratio(atk:def)	_ _ _		_ _ _		_ _ _	
	Guns & Msls	ratio(atk:def)	_ _ _		_ _ _		_ _ _	
TARGET DENSITY	Troop	men/meter	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
	Weapon System	"systems"/km	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
WEAPON DENSITY	Rifle Squad	squads/km	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
	Mortar	mortars/km	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
	Antitank	AT weapons/km	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
	Tank	tanks/km	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
	Artillery	guns & msls/km	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
	Air Defense	weapons/km	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
	Air Support	sorties/km/day	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
		O U T C O M E S						
TROOP ATTRITION		% / day	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
CASULATY RATIO		atkr:dfdr	_ _ _		_ _ _		_ _ _	
TANK LOSSES		% / day	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _	_ _ _
OPPOSED MOVEMENT		km / day	_ _ _		_ _ _		_ _ _	
COMBAT DURATION		hrs / day	_ _ _		_ _ _		_ _ _	

APPENDIX G

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GLOSSARY

air superiority
A characteristic of a force that enables it to conduct air operations at the time and place of the engagement without prohibitive interference from the opposing air force.

antitank weapons
The sum of all bazookas, shoulder-fired guided missiles, infantry cannon, and antitank guns.

artillery
In the benchmarks, it is the sum of all guns, howitzers, and ground-to-ground missiles. Tank guns were included in a few instances where they were employed in an artillery role.

attacker
That force which, in the first phase of an engagement, initiates significant offensive advance of its maneuver units.

battle
A significant combat encounter between hostile forces at various echelons of aggregation up to and including corps, army, and army group.

campaign
A related series of battles, all directed towards the same objective.

central
A characteristic of a simulated combat that lies within the interquartile range of values found in battles from 1937 through 1982.

cover
The vegetation or buildings in a battle area. The cover conditions on the sources describing a battle are grouped where possible as: forest, mixed trees, bare, swamp, desert, and urban.

defender
That force which, in the first phase of an engagement, chooses not to advance its maneuver units.

delay
A retrograde movement in which the defender slows down and damages an advancing enemy to gain time, but does not become decisively engaged in combat or allow himself to be outflanked.

distance advanced
The distance from the line of departure to the farthest point reached by significant maneuver elements of the attacking force, in kilometers measured along the axis of advance.

duration
The total number of days during which an engagement took place for at least one hour. A portion of a day is considered a full day.

engagement
A part of a battle where the data does not describe either all of the units in combat or all of the time that they were engaged or both.

fortified defense
A coordinated defense system prepared with sufficient time and material to complete planned entrenchments, field fortifications, and obstacles.

hasty defense
A defense normally organized while in contact with the enemy or when contact is imminent and time for battle preparation is limited. It involves use of foxholes, emplacements and obstacles. With enough time, usually taken to be 1 day, a hasty defense position can be improved to a prepared or fortified defense.

plausible
A characteristic of simulated combat that is lower than the top 5 percent and higher than the bottom 5 percent of values found in historical battles.

prepared defense
A defense prepared with time, often considered to be 1 day, to improve the position, but which due to lack of time and material has less than the strength of a fortified position.

resolution
The changes of position and location to both sides as a result of a battle.

success
The resolution of the combat in favor of one side or the other, considering how well each force accomplished its mission. In some battles, neither force or both forces have been successful.

surprise
Surprise occurs when one force is able to confront its opponent with tactical circumstances that the opponent did not anticipate or adequately prepare for. Surprise may be achieved with respect to time, location, maneuver or firepower.

terrain
The total topography of the battlefield as described in the sources; categorized as rough, rolling or flat.

weapons density
As used in the characteristic, "weapons systems density," the term means the sum of all crew-served ground weapons and rifle squads. It excludes close air support sorties.

weather
The weather conditions in the sources describing a battle are categorized where possible as: light [rain], heavy [rain], dry and snow.

width of front
The space from side to side or flank to flank occupied or covered by a force just before the engagement, measured in kilometers. The measurement following the shape of the front and ignores minor salients or restraints. It may be different for the two forces.

withdrawal
A movement in accordance with the will of a force's commander away from the enemy that terminates combat on contact with the enemy force.